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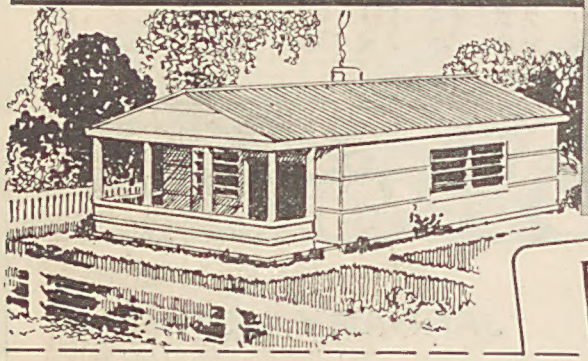

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WIMMERA WHEAT TESTS

Trials at Longerenong

By A. B. Hackwell, B.Agr.Sc., Agricultural Instructor, and B. F. McKeon, B.Agr.Sc., Science Field Officer

THE Cereal Experiment Station conducted by the Department of Agriculture at the Longerenong Agricultural College, in co-operation with the Council of Agricultural Education, is the main research institute in the Wimmera district for the investigation of problems associated with wheat farming in that area. The college is located at Dooen, eight miles east of Horsham.

With its black fertile plains especially adapted to wheat growing, the Wimmera district is noted for its high productive capacity. This district normally produces 39 per cent. of the Victorian wheat crop. During the past decade, the annual wheat production in the Wimmera was 15¾ million bushels, representing an average yield of 18.5 bushels per acre. In favorable seasons, yields of 40 bushels per acre are not uncommon on many farms in this area. The annual rainfall at Longerenong College is 16½ inches (average 48 years), of which 9 inches are normally received in the growing period of the wheat crop, from June to November inclusive. The plots are located on strong clay loam, typical of the black soil of the Wimmera plains.

The experimental work at this station commenced in 1907, and in the early years was confined mainly to the breeding and development of wheat varieties. Permanent field tests were first established in 1912, and from time to time the experiments have been revised and new investigations, including variety, rotation and soil cultivation trials, were introduced. In recent years the scope of the work has been considerably extended, and the method of experimentation used in the field has been modified in accordance with the latest scientific advances. At the present time, 164 acres are devoted to the tests, which embody investigations on all the main features associated with wheat farming. The experiments and demonstrations at Longerenong College have been of material assistance in providing information on problems involving the maintenance and improvement of wheat production in the Wimmera. Valuable results have been obtained to date, but many problems remain to be solved. In addition to the work at this station, subsidiary experimental plots are conducted by the Department of Agriculture at six other centres in the Wimmera, namely Salisbury and Winiam (near Nhill), Donald, Charlton, Kaniva, and Warracknabeal.

The Field Day 1940.

As in 1938 another very dry year was experienced at Longerenong in 1940, the season in general being more in line with that of the western Wimmera (Horsham to Kaniva), and considerably better than in the northern and eastern sections of that district.

The 27th annual field day, held on 4th December, was attended by a very representative gathering of over 500 farmers from all parts of the Wimmera. Visitors were welcomed by the chairman of the Council of

Agricultural Education, Mr. T. J. Purvis, and then conducted over the experimental fields by the Senior Inspector of Agriculture, Mr. W. B. Miller, and other officers of the Department. During the inspection of the plots several addresses reviewing the results of the various tests and their practical application on the farm were given. Keen interest was displayed in the new wheat variety, Ghurka x C.M.G., which is to be distributed to Wimmera farmers this season.

The question of pig production on wheat farms as a war-time expedient was featured also, and demonstrations were given by the Government Pig Expert, Mr. L. A. Downey, and the Dairy and Piggery Instructor at the college, Mr. G. Griffiths, on the feeding and general management of pigs. The results of some of the main trials at Longerenong and other Wimmera centres are summarized herewith:—

Wheat Variety Trials.

The varieties under test in the wheat variety section are reviewed each season, and new wheats are included from time to time to replace those discarded on account of their lower yielding ability or other inferior characters. In recent years several new crossbreds, which have been prominent in preliminary tests, have been promoted to the main trials. Special attention is paid to varieties possessing superior flour quality and some of these have also been included.

In the Senior Variety Trial 18 wheats were under replicated test last year, namely Ghurka, Baldmin, Dundee, Bencubbin, Magnet, Free Gallipoli, Regalia, Ghurka Selection, and progeny of the following crossbreds:—

Ghurka x C.M.G., Wannon x Ghurka, Ghurka x White Fife, Major x Ranee, Federation x Free Gallipoli.

A Junior Variety Trial, in which more recent crossbreds and selections are subjected to replicated test, was also conducted. The best of the wheats in this section will be promoted to the Senior Trial for further testing against standard varieties and more advanced crossbreds.

The variety trials were sown during June with 75 lb. seed and 1 cwt. of superphosphate per acre. The average yields obtained in past years in the departmental tests at Longerenong, together with the results at other centres in the Wimmera, are set out in Table I.

Prominent Wheats in the Wimmera Tests.

Ghurka.—This variety, which has been the principal wheat grown in the Wimmera for many years (*vide* Table II.), has proved itself a very prolific grain yielder. It is a free-stripping wheat with a short strong straw and is resistant to flag smut. Under some circumstances, however, its short straw is a disadvantage, for example, where the variety is required for hay or on areas where tall-growing weeds are troublesome.

Ghurka x C.M.G. 5543.—For several years this new wheat has shown outstanding yielding ability in the Wimmera trials, particularly on black land. In all tests at the four centres in the Wimmera, Ghurka x C.M.G. has given a higher yield than Ghurka every season, the average increase being 3.7 bush./ac. at Longerenong for five years and 3.5 bush./ac. at Salisbury (near Nhill) for three years. Also, on more mixed soil types at Donald and Charlton the crossbred has been superior to Ghurka in the past two seasons, the average increase being approximately one bush./ac.

The new wheat is equal to Ghurka in flour quality and disease resistance. Also it is a free stripping variety like Ghurka and is slightly taller with a strong straw. The crossbred is a brown-chaffed wheat and normally produces well-filled grain of good colour, and which does not crack readily.

Typical heads of the new Wimmera wheat, Ghurka × C.M.G.

Typical heads of Magnet wheat. This new variety was sown on 8,270 acres in the Wimmera in 1940.

Ghurka x C.M.G. 5543 has been approved by the Victorian Wheat Advisory Committee for distribution in the Wimmera at the end of this season and recommended as suitable for sowing on black land in that district.

There is insufficient evidence to date to warrant the recommendation of Ghurka x C.M.G. for areas other than the Wimmera. In the Mallee the crossbred possibly may not give yields equal to the standard varieties and the results of trials in other districts are, as yet, also inconclusive. Accordingly, the new variety will be distributed this season to Wimmera growers only.

Ghurka x C.M.G. was bred at the State Research Farm, Werribee, by the Government Cerealist, Mr. G. S. Gordon, and subsequently developed in the departmental plots at Longerenong College. Several selections of the crossbred are undergoing further tests.

Magnet—formerly Major x Free Gallipoli. This new wheat, also produced by the Department of Agriculture, was approved in 1939 for release in the Wimmera, particularly as a variety to replace Free Gallipoli. Several hundred bags of Magnet seed were distributed to farmers this year, over 8,000 acres being sown.

Magnet has out-yielded Ghurka in the trials on black land at both Longerenong (four years) and Salisbury (five years)—see Table I. The results on red land to date are not conclusive.

The new variety is white-chaffed, late-maturing, with a fairly tall, strong straw. It has good harvesting features and, although

Table I.—Wheat Variety Trials in the Wimmera.

Average Yields in Bushels Per Acre.

Variety.	Longerenong.			Nhill (Salisbury).		Donald (Red Land).		Charlton.
	5 years, 1935–39.	4 years, 1936–39.	2 years, 1938–39.	5 years, 1935–39.	3 years, 1937–39.	4 years, 1936–39.	2 years, 1938–39.	2 years, 1938–39.
Ghurka x C.M.G. 5543	44·4	43·2	31·2	..	39·7	..	25·2	26·3
Nizam x Free Gallipoli	..	44·2	31·3	..	..	..	..	..
Rajah x Gallipoli	41·5	40·9	31·0	..	37·6	..	22·4	25·4
Magnet	..	41·4	31·3	41·6	36·7	..	25·3	21·8
Ghurka	40·7	40·2	30·5	40·4	36·2	31·6	24·7	25·2
Ghurka Selection 595	..	..	32·2	..	34·9	..	23·5	25·4
Rance x Free Gallipoli	43·5	43·2	32·0	..	35·8	..	24·9	27·6
Major x Rance 6025	..	43·2	32·6	..	36·8	..	25·6	23·6
Wannon x Ghurka	..	43·0	33·0	..	..	..	..	..
Baldmin	..	40·9	29·8	39·6	35·2	..	24·2	28·8
Bencubbin	..	..	26·0	..	..	..	26·1	28·5
Nizam	41·3	39·2	29·0	..	..	31·1	21·6	20·1
Free Gallipoli	38·8	39·0	29·2	37·7	33·1	31·4	23·0	23·4
Dundee	..	38·4	28·4	36·4	32·7	33·6	25·2	24·4
Rance 4H	..	..	..	..	..	31·7	25·3	26·8
Regalia	..	..	29·3	..	..	31·5	24·6	27·5

NOTE.—The yields per acre quoted in this report are those actually harvested from the plots. Such yields are considerably higher (up to 20 per cent.) than would be the case if it were not necessary to have paths between the plots.

freer-stripping than Free Gallipoli, is not so readily threshed as Ghurka. The grain is of average size and colour and in flour quality is approximately equal to Ghurka and superior to Free Gallipoli. Magnet is also a useful wheat for hay purposes. Further supplies of Magnet seed will be available this season to Wimmera farmers.

Baldmin has given good yields in all the Wimmera experimental plots, although slightly below Ghurka in that respect. It is a medium-strong wheat suitable for limited sowing and is early-maturing, white-chaffed and fairly tall.

Baldmin straw, on account of its brittle nature, has a tendency to break readily at harvest—this sometimes causes inconvenience through "choking." The variety is best handled with a header and should be harvested promptly. Further, its large vitreous grain, in certain seasons, may be somewhat pinched and wrinkled.

Dundee has been tried by many Wimmera growers in the past three years with good results in some cases but only moderate in others. In the experimental plots Dundee has yielded relatively better on red ground (Donald) than on black soil, being much inferior to Ghurka and other varieties on the latter type of land. It is susceptible to rust and although classed as a medium-strong wheat, its flour quality has been irregular.

All factors considered, Wimmera farmers are advised not to sow Dundee on black land and to restrict the variety to limited sowings on the red and mixed soils.

Other Varieties.—The earlier maturing variety **Ranee 4H** has proved comparatively unsuitable for Wimmera black land but is recommended second to Ghurka for red and mixed soils. **Nizam**, one of the older Wimmera wheats, has yielded well in some of the tests, but is not advocated for extensive sowing, while **Free Gallipoli**, it is expected, will gradually be replaced by Magnet and Ghurka x C.M.G.

Bencubbin, Regalia and **Ghurka Selection** are three of the leading wheats in the Mallee plots—up-to-date, however, they have not been prominent in the Wimmera tests. Possibly they may prove useful, like Ranee 4H, on the "fringe" country in the northern section of the Wimmera, and experiments to test the varieties on such soils were initiated at Warracknabeal this season, on the farm of Mr. W. Altmann.

Several of the lower quality crossbreds such as Nizam x Free Gallipoli and Rajah x Gallipoli were among the varieties eliminated from the various tests this year.

The wheats recommended for the Wimmera by the Victorian Wheat Advisory Committee are as follow:—

——	Main Sowing.	Limited Sowing.
Wimmera black land ..	Ghurka	Magnet Free Gallipoli Baldmin Nizam Ghurka × C.M.G.
Wimmera red and mixed land	Ghurka	Ranee 4H Free Gallipoli Nizam Dundee Baldmin

The main varieties now grown in the Wimmera, together with their percentage of the total area in the past three seasons are listed in Table II. Ghurka is by far the most popular variety occupying over 60 per cent. of the area sown. Other features are that Dundee and Free Gallipoli have both declined in recent years, whereas there has been a slight increase in the relative acreage of Ranee 4H, Bencubbin and other varieties.

TABLE II.—TEN PRINCIPAL WHEAT VARIETIES SOWN IN THE WIMMERA.

(As estimated by the Government Statist.)

Variety.	Acres, 1940–41.	Percentage, 1940–41.	Percentage, 1939–40.	Percentage, 1938–39.
Ghurka	505,257	60·4	63·5	63·2
Dundee	88,180	10·5	10·7	12·3
Ranee (including 4H)	85,510	10·2	9·5	7·6
Free Gallipoli ..	66,740	8·0	9·1	11·3
Bencubbin ..	27,630	3·3	2·0	1·2
Bobin	13,530	1·6	1·0	0·5
Nizam	8,690	1·1	1·2	1·0
Magnet	8,270	1·0	..	..
Regalia	5,930	0·7	..	..
Rajah	4,180	0·5	0·3	0·2
All other ..	22,773	2·7	2·7	2·7
Total ..	837,000	100 0	100 0	100·0

Wheat Manurial Trials.

Permanent Test.—The object of this experiment is to demonstrate the effects of various fertilizers on the wheat crop. The trials are located on two permanent sites on black land and have

Harvesting wheat plots at Longerenong.

been conducted for 28 years. The quantities of the various manures applied, together with the average yields obtained since 1912, are shown in Table III.

TABLE III.—PERMANENT WHEAT MANURIAL TRIALS.

Average Results 28 Years, 1912-39.

Manurial Treatment per Acre.	Average Yield.
	bus./ac.
No manure	34·4
Super. ½ cwt.	38·6
Super. 1 cwt.	40·0
Super, 2 cwt.	40·8
Super. 1 cwt. + lime 5 cwt.	39·5
Super. 1 cwt + lime 10 cwt.	38·9
Super. 1 cwt. + nitrate of soda 40 lb. applied with the seed	39·1
No manure	34·3
Basic slag, 1 cwt.	35·8
Super., 1 cwt.	39·2
Super. 1 cwt. + nitrate of soda, 40 lb. + potassium sulphate, 40 lb.	39·2
Super. ½ cwt. + basic slag, ½ cwt.	38·2
Super. 1 cwt. + nitrate of soda, 40 lb. in spring	39·3
Farmyard manure, 10 tons	35·9
No manure	35·3

The plots are each $\frac{1}{12}$ acre, and, since 1935 have been sown with Ghurka wheat.

The results demonstrate that under Longerenong conditions it does not pay to use fertilizers other than superphosphate. The increased yields from the various applications of this manure are shown in the following table, together with the net monetary return obtainable in each case, with wheat valued at 2s. 6d. per bushel and superphosphate at £5 10s. per ton on the farm. The table is a guide to the most economical dressing to use in general practice. The results indicate that, at the prices shown, an application of approximately 1 cwt. per acre is the most payable one to apply on land similar to that of Longerenong.

TABLE IV.—EXTRA RETURN PER ACRE DUE TO SUPERPHOSPHATE.

—	Average Yield 28 Years, 1912-39.	Increase due to Super.	Value of Increase at 2s. 6d. per Bushel.	Cost of Super at £5 10s. per Ton.	Extra Return per Acre due to the Super.
	bus./ac.	bus./ac.	s. d.	s. d.	s. d.
No manure ..	34·4	..	..	..	..
Super., ½ cwt...	38·6	4·2	10 6	2 9	7 9
Super., 1 cwt...	40·0	5·6	14 0	5 6	8 6
Super., 2 cwt...	40·8	6·4	16 0	11 0	5 0

Replicated Test.—In 1933, a further series of manurial trials was introduced to compare a dressing of 1½ cwt. of superphosphate with the above applications. The plots were replicated and sown under the randomized block system. The average yields, (1933-39), in bush./ac. were as follow:—

		Increase.
No manure	37.6	—
Super. ½ cwt.	39.1	1.5
Super. 1 cwt.	40.2	2.6
Super. 1½ cwt.	40.8	3.2
Super. 2 cwt.	40.3	2.7

In this test over seven years the increase due to superphosphate has not been so marked as in the permanent trial over 28 years. The results, however, confirm the use of 1 cwt. of superphosphate per acre as the standard dressing for black Wimmera fallow.

Since 1937, super. and ammonia 1—1 at 2 cwt. per acre has also been included in this trial, but its use was definitely unprofitable.

Zinc Sulphate.

Following the discovery in the Nhill district by the Department of Agriculture in 1936 of the possibilities of zinc sulphate, applied with superphosphate, in increasing the yield of wheat crops in the Wimmera, extensive experiments with this mineral have since been undertaken at many centres. The tests include varying quantities of zinc sulphate applied with and without superphosphate and miscellaneous investigations on aspects such as residual effect, forms of zinc, &c.

The results of the main trials at Longerenong and Salisbury (near Nhill) during the past three years are summarized in Table V., and it will be noted that at both centres a definite increase in the wheat yield, due to the zinc sulphate, has been obtained.

TABLE V.—ZINC SULPHATE TRIALS, LONGERENONG AND SALISBURY (ON BLACK SOIL).

Wheat Yields in Bus./Ac.

Treatment per Acre.	Longerenong.		Salisbury.	
	Yield.	Increase Due to Zinc.	Yield.	Increase Due to Zinc.
	Av. 3 Years 1937–39			
Super 1 cwt.	34·6	..	36·3	..
Super 1 cwt. + Zinc 20 lb.*	35·6	1·0	41·0	4·7
„ 1 cwt. + „ 10 lb.*	36·5	1·9	..	..
	Av. 2 Years 1938–39.			
Super 1 cwt.	31·4	..	30·7	..
Super 1 cwt. + Zinc 20 lb.	32·6	1·2	33·2	2·5
„ 1 cwt. + „ 10 lb.	33·2	1·8	33·2	2·5
„ 1 cwt. + „ 5 lb.	33·9	2·5	33·4	2·7
„ 1 cwt. + „ 1 lb.	31·1	..	31·6	0·9

* Zinc Sulphate 30 lb. and 15 lb. used in 1937.

The extra yield at Longerenong from the various dressings of the mineral ranged from 1.0 to 2.5 bush./ac. and was lower than that recorded at Salisbury, namely, 2.5 to 4.7 bush./ac.

Regarding the Wimmera experiments in general, the response from the zinc sulphate has been more marked in the western and central

Effect of zinc sulphate on wheat crop at Nhill.

Left, super. only. *Right, super. + zinc sulphate.*

Plots of subterranean clover in the Wimmera showing increased growth due to the application of zinc.

portions of the district than in the eastern zone and, on the whole, the mineral has been more beneficial on black land. On the red and loamy soils the results have been variable, definite responses being obtained in some cases, while in others the material had no effect.

The mineral costs approximately 2d. per lb., and as the requisite dressing—5 to 10 lb. per acre—is comparatively cheap, only a small increase in the wheat yield is required to warrant its use.

Reviewing all the evidence to date, the tests demonstrate that on many farms in the Wimmera, particularly on the black soils in the western section of the district, the use of zinc sulphate is an economic means of increasing, to a certain extent, the wheat yields on fallowed land.

Wheat growers desirous of testing the mineral on their own paddocks are advised to apply it at the rate of 5 to 10 lb. per acre, mixed with the superphosphate. The mixing can be done any time before cropping, as experience has indicated that there is little risk of the mixture losing its free-running texture, provided the materials are reasonably dry when mixed and kept in that condition. It is very advisable, on land where the mineral is being tried, for farmers to leave some strips sown without zinc so that comparisons can be made between the treated and untreated crop.

Trials with Zinc on other Crops.

With oats, subterranean clover, phalaris and flax, when sown on fallow, the effect of zinc sulphate, applied in addition to superphosphate, has been quite pronounced—increased height, growth and depth of colour being obtained.

The discovery that clovers, and possibly other pasture plants, will respond to applications of zinc may be of great importance in the development of pastures in the Wimmera.

With stubble-sown oats, no conclusive results, as yet, have been obtained at either Longerenong or Salisbury. In some instances a residual effect from the mineral applied to the wheat crop in the previous year, has been observed.

Tests in 1940.

The investigations with zinc sulphate at Longerenong last season comprised the following sections:—

(i) Replicated trials with *wheat* on fallow and *oats* on stubble using varying amounts of zinc sulphate applied alone, with superphosphate and with super. and ammonia mixture.

(ii) Replicated test with five different forms of zinc applied to *wheat* and *oats* on fallow.

(iii) Observation plots—*wheat*—to investigate the effects of zinc under various soil and seed treatments.

(iv) *Flax* trial—three varieties treated with superphosphate and zinc.

(v) Miscellaneous tests on various aspects such as time and method of application of the zinc.

(vi) Trials to investigate the establishment of various *pasture plants* on cropped land, when treated with various minerals —particularly zinc sulphate. Each of the following species, namely, Wimmera rye grass, perennial rye grass, phalaris, subterranean clover, burr medick, barrel clover and lucerne is being tested with a cover crop of wheat sown at 40 lb. per acre and without a cover crop.

Mineral Deficiency Trials.

WHEAT AND OATS.

In addition to the minerals such as phosphate, nitrate, potash and calcium, which are recognized as being essential for plant growth, it has been established that certain "trace" elements, so called because they are required in minute quantities only, are also necessary for optimum plant development. Six of these "trace" elements or minerals are being tested, on wheat and oats, to investigate whether any of them are deficient in Longerenong soils. Each mineral was applied in addition to superphosphate, both crops being sown on fallow.

In the 1939 season some of the minerals gave a slight response with wheat and oats, but the increases were not significant. The results in the wheat section are shown in Table VI.

TABLE VI.—MINERAL DEFICIENCY TRIALS, 1939.

Treatment per Acre.	Wheat Yield Bus./Ac.
Super 1 cwt.	44·8
*Zinc sulphate 10 lb.	47·4
*Copper sulphate 15 lb.	47·0
*Iron sulphate 56 lb.	46·0
*Borax 5 lb.	45·4
*Magnesium sulphate 56 lb.	44·9
*Manganese sulphate 30 lb.	44·3
*Mineral mixture 30 lb.†	44·0
*Ammon. Sulph. 1 cwt. + Mineral mixture 30 lb.†	44·7

* Each mineral was applied with super. at 1 cwt./ac.

† The mineral mixture consisted of equal parts of zinc, copper and manganese sulphates.

The experiments conducted by the Department of Agriculture at Longerenong College are very comprehensive, and in 1940 the total area sown with plots was 70 acres. In addition to the tests reviewed above, many other investigations are in progress, including time and rate of sowing tests, fallow cultivation trials, crop rotation, grazing and pickling tests. There are also various experiments with oats and barley, and a section is devoted to cereal breeding and seed production.

A booklet summarizing all the experimental work now undertaken at Longerenong is obtainable free on application to the Department of Agriculture, Melbourne, C.2.

Pasture Research

Through the secretary of the Council for Scientific and Industrial Research, we have received a catalogue of publications of the Imperial Bureau of Pastures and Forage Crops, Penglais, Aberystwyth, Wales.

This bureau (like the several other Imperial Agricultural Bureaux) publishes journals and bulletins of great interest and value to research workers, advisers, and lecturers concerned with pastures and forage crop improvement.

It collects and disseminates information from all over the world, and orders for publications now would help it to continue its valuable work. *Herbage Abstracts* is a quarterly abstracting journal, and vol. 10 (1940) and all previous volumes are available to subscribers in the British Commonwealth for 20s.

Herbage Reviews is also issued quarterly, and is intended to supply more detailed information on various subjects than can be given in a short abstract.

Specimen copies of both the above will be sent on request to the Deputy-Director of the Bureau.

Included in the bulletins published is No. 29, which deals comprehensively with Grassland Investigations in Australia (price, 5s.).

Design for a Cheap Roadside Shelter for Cream, &c.

By J. M. Kerr, Superintendent of Dairying

DELIVERY of milk or cream to the road for pick-up by the road transport necessitates that, at least, shade be provided during the period of waiting.

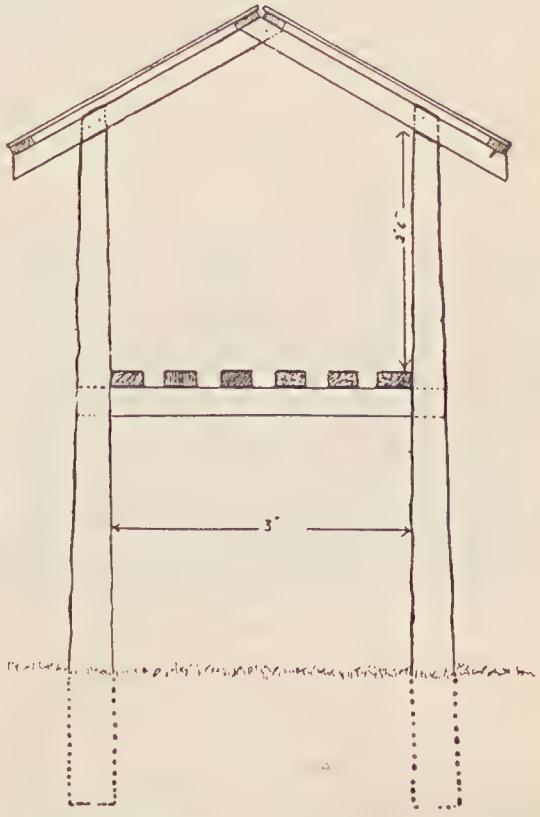
While the Department of Agriculture does not wish to discourage the thorough type of farmer who will do things properly or not at all, or the one who insists on having architectural neatness in everything he builds, it does not demand of the farmer anything more than adequate protection of the cans from the direct rays of the sun and from contamination by dogs, ants, &c. In the choice of a site all natural shade should, of course, be taken advantage of, but if no shade exists consideration might be given to the planting of shade trees.

The floor of the structure should be at least 2 feet from the ground, and faced so as to ensure protection from the sun when the stand is in use. If the shelter cannot be given a north or south front, it will be necessary to include either a fully-closed end or a door as well as a roof, but, if it fronts either south or north, the overhang which the roof can be given at the side (and this should be liberal) will obviate largely the necessity for a fully-closed side. The only directions from which the sun can strike seriously are from east around to south-east (on the east side) and from west around to south-west (on the west).

The type of structure illustrated will be found quite suitable. Because it is wished to leave the roofing material to the constructor's own option, the drawings show only the frame, minus the roof.

The design dispenses with wall plates and ridge board, the rafters being attached directly to the post-tops (let in or not, at builder's option). Though the recessing of the rafter into the post makes a stouter job, the roof is only light, and mere nailing will suffice.

The posts may be ordinary split fence-posts, old or new, so long as the ends, and the top particularly, are sound.



Front elevation, showing frame-work of shelter.

The material required is equivalent to:—

Posts.—Four fence posts, 6 ft. 6 in. long.

Floor Bearers.—Two pieces of 4-in. x 2-in. hardwood, 4 feet long (to be let into the posts and nailed).

Flooring.—Six pieces 4-in. x 2-in. hardwood, 4 feet long (to be spaced about 2 inches and nailed down).

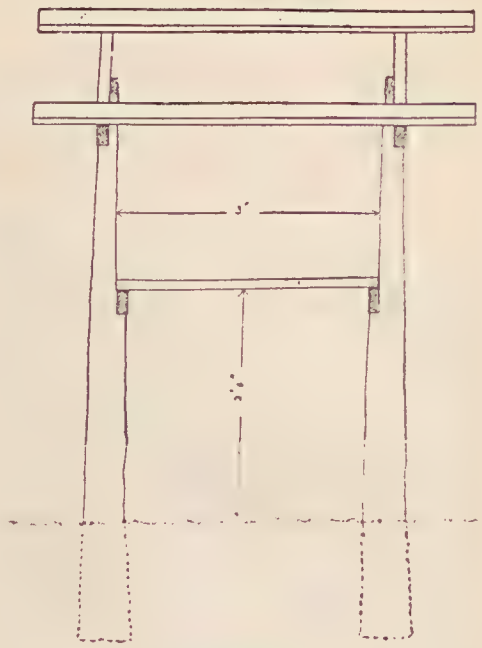
Rafters.—Four pieces of 3-in. x 2-in. hardwood, 3 feet long (to be let into side of posts at top and nailed).

Purlins.—Four pieces 3-in. x 1-in. hardwood, 5 feet long (to be nailed down on rafters at top and bottom) with about a foot of projection over the rafters at each end.

Roofing.—Fourteen pieces of 6-in. x ½-in. board, each 3 feet long, spaces 2½ inches, nailed to rafters and covered with rubberoid or even cement-washed hessian. (Once frame is provided as per diagram, roof may be of palings, bark, thatch, boughs, according to local convenience and state of owner's purse. Galvanized iron is quite satisfactory for roof, and its not being recommended is only because of cost.)

In the above specifications it is assumed that mostly sawn timber will be used, but there is no reason why round bush timber should not be used throughout, if more readily available. It is also assumed that the size is to be 3 feet square, but if only one can is to be stored at a time it could be considerably smaller.

If ants are troublesome, they can be fairly satisfactorily excluded by smoothing a ring around each post between the floor and the ground and tacking a strip of furred skin closely around.



Side elevation.

Hints on Stitching Wounds in Animals

Treatment of wounds in animals, whether clean cut, incised, or torn and lacerated, often entails the use of sutures, (more commonly known as stitches). However, before stitches are applied, it is essential that if severe bleeding is taking place, attempts must be made to arrest it—if necessary by ligating any large blood vessel.

The next step is to clip closely with a scissors, or preferably shave the hair round the edges of the wound and for some distance beyond it. This area should then be painted with tinture of iodine.

The cleaning and disinfection of the interior of the wound is the next essential step. This is of vast importance. Any foreign bodies must be removed and in lacerated wounds all bruised or necrotic tissue should be taken out. A thorough irrigation of the wound with a reliable antiseptic solution then follows.

It always must be remembered that in stitching wounds, efficient drainage must be provided. Neglect of this precaution may give rise to unfortunate complications. Various types of stitching material are available, and there are several methods of stitching. For all skin stitches, non-absorbable material such as silk should be used. It is necessary to sterilize the silk and needles by boiling prior to use.

The method of stitching most commonly used, and which probably gives the best results is to make a number of distinct stitches, each separately tied and complete in itself, and placed at intervals along the direction of the wound. One or more of these stitches can, if necessary, be removed without disturbing the remainder. In tying the stitches care should be taken to avoid unnecessary tension.

In the after treatment of stitched wounds, one must be guided by the progress attained and the occurrence, or not, of complications.

Pasture Investigations

Results of 1939 Trials

Extracts from the Eighth Annual Report of the Experimental Pasture Work conducted by the Department of Agriculture for the Victorian Pasture Improvement League. The first portion of this report containing a general review of the pasture situation in 1939, weather conditions, a summary of results of manurial experiments, and also the results of pasture trials in the Gippsland and Western Districts, was published in this Journal for December, 1940.

By R. L. Twentyman, B.Agr.Sc., Agrostologist.

DURING the early years of these investigations, the experimental work was restricted mainly to southern Victoria, but in 1938 an extension of the work was made to the North-East and Lilydale districts, four new trials being established. Each new trial included a mowing manurial area, grazing trials on fertilized pasture, and also a pasture mixture and strain trial.

The design adopted for the mowing plots was similar to that used for the new mowing trials established in Gippsland and the Western District in 1935. The mowing trials of the original major plots provided for six replications of each treatment, but, as the individual plots consist of long narrow adjacent strips, it has usually been found that the variations between plots, for reasons other than the manurial treatment, have been very small. Consequently, in the establishment of these new plots it was considered unnecessary to provide for any more than three replications of each manurial treatment, and this has permitted a larger number of treatments to be included without making the whole plot inconveniently large.

The individual plots are 60 feet long and 4 ft. 6 in. wide (30 square yards), and two 20-in. mower strips are cut out of each, in order to measure the yield. Each trial consists of three blocks or sections, each section containing a complete series of each of the various manurial treatments. In some cases the actual treatments being compared have been applied to adjacent plots, and as a consequence small differences between these treatments can be readily detected.

In laying down these new plots, nitrogenous fertilizers have been omitted, as the results of the earlier experiments showed that, except in special circumstances, their use on pasture land cannot be justified, and, used in conjunction with other fertilizers, they often mask or inhibit the beneficial effects of these other fertilizers. In the earlier trials, dressings of 2 and 3 cwt. superphosphate per acre were used, but in these new trials dressings of ½, 1, 2, and 3 cwt. per acre are being tested in order to determine if the sustained response of the lighter dressings will compensate for the greater initial response of the heavier dressings.

Measuring the growth on a small mowing trial.

So far the responses to these treatments have been almost proportional to the amounts applied, except that 2 cwt. appears to be the useful limit. It is hoped that in the following years, comparisons between the response to the various amounts of super. in the early and the subsequent years may throw some light on the rate of depletion of soil potash.

The sown sections of the plots at Kiewa and Wangaratta made a poor establishment during the drought of 1938 and, together with the Benalla plots, they were re-sown early in 1939. Favoured by the abundant autumn

rains, these plots made prolific growth in 1939, and in most cases have since achieved an excellent establishment. Observations will be made in subsequent years on the survival, persistency, and productivity of the sown species.

The grazing sections of the trials, which have been established in the North-East and at Lilydale, made abundant growth last year, but, except for an unusually good response to potash at Lilydale, these plots have as yet not shown any very marked responses to the manurial treatment.

RESULTS OF NORTH-EAST TRIALS.

Benalla (W. J. Pearson).

Annual Rainfall—26.3 *inches. Rainfall,* 1939 —43.0 *inches.*

Soil—a grey yellow silt loam carrying a pasture of Danthonia and subterranean clover. Previous to the establishment of the plot, this paddock had received some top-dressing with superphosphate. Subterranean clover had been introduced, and the pasture had been considerably improved.

In the first year the pasture on the mowing plot consisted of a number of patches of almost pure Danthonia and others consisting largely of subterranean clover. Under the dry conditions experienced in 1938, the Danthonia was able to prevent the entry of subterranean clover into these patches, despite the fact that the area had been surface worked and sown with subterranean clover seed. For this reason the yields during the first year were rather erratic. In the past year, however, favoured by ample soil moisture, the subterranean clover invaded and overgrew the Danthonia patches, and the yields from the individual strips are now much more uniform.

So far the manurial responses on these plots have not been large, but there has been a definite response to superphosphate, the heavier dressings giving greater increases than the ½ cwt. dressing. There was no appreciable response to either potash or lime on this trial in 1939.

TABLE XX.—MANURIAL TRIALS, BENALLA, 1939.

No Manure.	Super. ½ cwt.	Super. 1 cwt.	Super. 2 cwt.	Super. 2 cwt., Potash 1 cwt.	Super. 2 cwt., Potash 1 cwt., Lime 1 ton.	Super. 2 cwt., Lime 1 ton.	Super. 3 cwt.
Yields in cwt. of Greenstuff per Acre.							
288	354	401	429	423	434	420	421

Kiewa (I. S. Wallace).

Annual Rainfall—32.3 *inches. Rainfall,* 1939, 48.6 *inches.*

The soil is a fine sandy loam carrying a pasture of Danthonia, kangaroo grass with silver grass and subterranean and suckling clovers.

The plot has shown a small but increasing response to superphosphate, but 2 cwt. per

Phalaris is a promising species in the North-East. A good stand near Kiewa is illustrated.

Section of the small grazing trial area at Wangaratta.

acre seems to be the useful limit. Neither lime nor potash effected any improvement in growth on this area during 1939.

TABLE XXI.—MANURIAL TRIALS, KIEWA, 1939.

No Manure.	Super. ½ cwt.	Super. 1 cwt.	Super. 2 cwt.	Super. 2 cwt., Potash 1 cwt.	Super. 2 cwt., Potash 1 cwt., Lime 1 ton.	Super. 2 cwt., Lime 1 ton.	Super. 3 cwt.
Yields in cwt. of Greenstuff per Acre.							
194	236	262	313	295	299	296	305

Wangaratta (S. D. Webb).

Annual Rainfall—24.8 *inches. Rainfall,* 1939, 45.6 *inches.*

The soil is a grey brown silt loam of good depth, carrying a pasture of mainly subterranean clover with some cape weed and a small amount of Danthonia, soft brome, and barley grass.

This plot has shown a good response to superphosphate, the increases being progressive with heavier applications. Neither lime nor potash has yet exerted any material benefit.

TABLE XXII.—MANURIAL TRIALS, WANGARATTA, 1939.

No Manure.	Super. ½ cwt.	Super. 1 cwt.	Super. 2 cwt.	Super. 2 cwt., Potash 1 cwt.	Super. 2 cwt., Potash 1 cwt., Lime 1 ton.	Super. 2 cwt., Lime 1 ton.	Super. 3 cwt.
Yields in cwt. of Greenstuff per Acre.							
253	341	408	477	486	484	468	501

MOWING TRIALS—LILYDALE DISTRICT.

Mowing manurial trials were established in the Lilydale district in 1938 and, though the yields obtained during the first year were low owing to dryness, the pastures made a good recovery in 1939, and good yields were recorded.

As a result of fertilizer treatment, the pastures in this district have recently been greatly improved, but there is still much doubt as to whether super. alone is capable of effecting this improvement, or whether lime is required in addition.

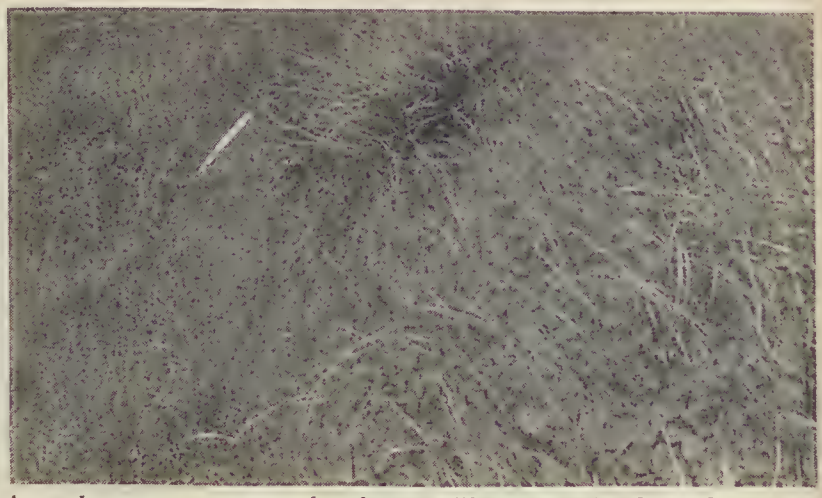
The soils on which the pastures are growing have been developed largely from silurian mudstones, and in an unimproved condition carry a pasture of Danthonia and kangaroo grass. The district receives a 34-inch rainfall, and usually is very wet in the winter, but as dry as most other parts of southern Victoria during the summer period.

Pasture improvement in this district has been effected mainly by sowing subterranean clover and perennial rye-grass and top-dressing with superphosphate, with or without lime. Both areas on which the experiments are being conducted had previously received several top-dressings with superphosphate, and, as might be expected under these circumstances, the response of the plots to superphosphate has not been large.

Heavier dressings of superphosphate have shown a somewhat better result than the lighter dressings, but the response even from the heavy dressings is comparatively poor. Some additional responses have been recorded where either lime or potash has been applied or where both have been applied in addition to the superphosphate.

Grazing trials, which were laid down at Coldstream early in 1939 on a rather stronger pasture than that on which the mowing trial is located, have so far shown a poor response to both lime and superphosphate, but quite a marked response to the dressings of potash. This pasture had previously been used as a grazing paddock, with an occasional cutting for grass hay, and it is interesting to note that from the outset it has shown a response to potash.

The yields obtained from the Lilydale plots are shown in the following tables :—



A good response to superphosphate at Wangaratta in the early spring of 1939.

Lilydale (Yering) Trial (J. W. Reade).

Average Rainfall—34.8 *inches. Rainfall,* 1939, 48.0 *inches.*

Soil consists of a medium grey silt loam overlying silurian mudstone. The experimental plot, like much of the district, tends to be very wet during the winter months, and carries a pasture of bent grass and subterranean clover, together with onion grass, perennial rye-grass, and some Yorkshire fog. The pasture had previously received several autumn top-dressings with superphosphate, and had been cut for grass hay during the two previous years.

So far the plot has only shown a small response to superphosphate, the super. 1 cwt. plots giving almost as large an increase as either super. 2 or 3 cwt. Both lime and potash, either alone or together, have considerably increased growth when applied in addition to the super.

The yields obtained during the past year from the Yering plot are shown in Table XXIII.

TABLE XXIII.—MANURIAL TRIALS, LILYDALE (YERING), 1939.

No Manure.	Super. ½ cwt.	Super. 1 cwt.	Super 2 cwt.	Super. 2 cwt., Potash 1 cwt.	Super. 2 cwt., Potash 1 cwt., Lime 1 ton	Super. 2 cwt., Lime 1 ton.	Super. 3 cwt.
Yields in cwt. of Greenstuff per Acre.							
280	295	318	326	358	398	362	326

A good response to superphosphate on a Western District plot.

Lilydale (Coldstream) Trial (J. P. Doake).

This soil consists of a rather poor grey silt loam derived from silurian mudstone. The pasture was sown down eight years ago, and had been regularly top-dressed, but had not responded well to this treatment. At the time of commencing the experiment the pasture consisted mainly of bent grass, Yorkshire fog, subterranean and suckling clovers, with some festuca bromoides and moss.

On this trial superphosphate alone has effected only a small improvement in growth, but there is an increasing response from the heavier dressings, the progressive increases from super, ½, 1, 2, and 3 cwt. per acre being clearly shown. Potash and lime, applied either together or added separately to the super., have resulted in a much better response than that achieved with super. alone.

The yields obtained during the past year are shown in Table XXIV.

TABLE XXIV.—MANURIAL TRIALS, LILYDALE (COLDSTREAM), 1939.

No Manure.	Super. ½ cwt.	Super. 1 cwt.	Super. 2 cwt.	Super. 2 cwt., Potash 1 cwt.	Super. 2 cwt., Potash 1 cwt., Lime 1 ton.	Super. 2 cwt., Lime 1 ton.	Super. 3 cwt.
Yields in cwt. of Greenstuff per Acre.							
217	222	231	241	269	303	287	258

NEW GRAZING MANURIAL TRIAL ON WESTERN DISTRICT PASTURE.

Pirron Yallock (Mr. G. Howey).

Early in the spring of 1939, a new grazing trial was established at Pirron Yallock in the Colac district on a pasture which recently has not been responding satisfactorily to superphosphate. This trial has been established mainly to determine if potash will overcome this lack of response, and, if so, to ascertain the quantity required for the purpose.

The plots are open to stock, but are individually fenced off. Each plot is ⅛ acre in area, and the trial includes the following treatments.

(1) No manure.
(2) Super. 1 cwt. per acre.
(3) Super 2 cwt. per acre.
(4) Super. 1 cwt. + pot. chloride ½ cwt. per acre.
(5) Super. 1 cwt. + pot. chloride 1 cwt.
(6) Super. 1 cwt. + pot. chloride 2 cwt. per acre.
(7) Super. 1 cwt. + lime 1 ton per acre.
(8) Super. 1 cwt. + lime 1 ton + pot chloride 1 cwt. per acre.
(9) Super. 1 cwt. + Cement works "precipator dust" ½ ton per acre.

Those plots quickly showed a response to the potash fertilizer, the improved growth being quite marked within a month of the application in the spring of 1939. The "precipitator dust," which contained about 11 per cent. potash also gave an excellent response. It is expected that these plots will furnish evidence as to the minimum quantities of potash required to effect a sustained improvement in pasture growing on a potash deficient soil.

Irrigated Pastures

Trials in the Northern Irrigation Areas

By A. Morgan, B.Agr.Sc., Irrigation Officer, and G. B. Rayner, B.Agr.Sc., Assistant Agrostologist.

The history of experimental work in the northern irrigation areas extends back over the past sixteen years. From 1924 to 1931 manurial trials on lucerne were conducted by the Department of Agriculture at Tongala, Cohuna, and Swan Hill; and in 1927 pasture establishment trials were instituted at Stanhope. Pasture plots were established at Tongala and Cohuna in 1933 on the sites of the former lucerne trials, the layout of these plots being identical with that used for the lucerne. Two years later, as an extension of the Victorian Pasture Improvement League scheme, new plots were sown at Kerang and Swan Hill; these plots included both species establishment and manurial trials. By 1935 pasture plots had been established at Stanhope, Tongala, Cohuna, Kerang, and Swan

An excellent irrigated pasture at Tongala.

Hill. These were of a purely observational character, and while differences between manured and unmanured strips of pasture were apparent to the eye, differences between plots treated with various amounts and combinations of manures were not so easily detected. In order to obtain accurate measurement of these differences, mowing trials were established in June, 1938—under the auspices of the Pasture Improvement League —at each of these centres except Kerang. The pasture plots already in existence were utilized at Swan Hill, Cohuna, and Tongala; while at Stanhope a new set of manurial plots was laid out on a six-year-old pasture, adjacent to the former species trials. This pasture had been regularly and uniformly top-dressed with superphosphate since sowing down.

At each centre the manurial plots were divided into duplicate sets with the intention of mowing and grazing each set in alternate years. However, while plots are being grazed, the animals have free range over the whole area, and with the small differentially manured strips so close together the possibility of the transference of fertility from the heavily manured strips to the unmanured ones, by the medium of the animal droppings, is worthy of consideration, as it would tend to diminish the differences obtained by the first few cuts with the mower. Furthermore, the plots at Stanhope had been uniformly top-dressed with superphosphate for six years prior to cutting, and the residual value of this manure would tend to increase the yields from the unmanured and lightly manured strips during the first year of cutting. It was therefore decided at the end of the first year to continue mowing the same plots for a further year before changing over.

Swan Hill (A. Douglas).

The plots at Swan Hill suffered no restriction in water supply during the 1938-39 season during which twenty irrigations were given at an average interval of twelve days. The extraordinarily high-carrying capacity of 1.5 cows per acre was recorded for the season. This represents an increase of 15 per cent. on the previous year, and reflects the steady development of the sward.

Perennial rye-grass and white clover have now spread over the whole species trial area, but they by no means completely dominate the sward, as several other species have proved their adaptability to the locality. *Phalaris tuberosa* has done particularly well, and cocksfoot, alsike clover, and lucerne are also prominent on those sections where they have been sown. The tall fescue plot is now very

[*Continued on page 43.*

Live Stock Notes

Reminders for January—February

Compiled by A. C. T. Hewitt, M.Agr.Sc., Livestock Science Officer

Lucerne.

LUCERNE, or alfalfa as it is called in the United States of America, has been described as the king of fodders. It is used by all classes of livestock either as a pasture crop, as cut green feed, as hay or as silage. Lucerne first came into prominence as a cattle food, but has since been widely used in the rations of sheep, horses, pigs, and poultry.

The lucerne plant will survive under conditions which are fatal to many crops, but on the other hand it will not tolerate some conditions which suit quite a number of ordinary crops. A pamphlet on the cultivation of lucerne is obtainable free of cost on application to the Director, Department of Agriculture, Melbourne, C.2.

Lucerne is a summer-growing perennial, and because of its deep-rooting habits an established stand will live and grow during dry periods when most other forages die off. If the roots are able to strike underground moisture, the plants will thrive under drought conditions.

Heavy grazing reduces the life of the stand. Grazing also is inadvisable, because it tends to cause bloat in cattle and sheep, especially if stock are turned into a luscious stand on an empty stomach. Green lucerne also imparts an undesirable taint to milk which makes it unfit for retail purposes. However, this taint is removed by pasteurization.

Cut, green lucerne is an excellent supplement for all housed and stall-fed stock. It is rich in protein, minerals—lime in particular—and vitamin A. For these and other health-giving properties it is widely used for poultry, pigs, and horses in metropolitan areas. Unthriftiness in fowls and pigs could be corrected by a more liberal feeding of green lucerne. On most farms a continuous supply of green stuff could be maintained by the growth of lucerne for spring, summer, and autumn requirements, and oats for the winter.

Lucerne hay is the most important lucerne fodder, but its value depends largely upon when the lucerne is cut, and how carefully it has been harvested and stored. Bad weather at harvesting and over-curing of the hay are the most frequent causes of low quality. In northern irrigation districts the hay frequently is stacked the day after it is cut. It is considered safe to stack when no moisture is observed after twisting the stalks to breaking point. At this stage the hay is tough and the leaves do not fall off. The leaves are the most nutritious part of the hay. With modern baling and chaffing machinery, lucerne hay can be converted quickly into forms that are easily handled for transport and market purposes.

Average quality lucerne hay contains 14.9 per cent. crude protein. It has a protein equivalent of 8.3 per cent., and a starch equivalent of 35 per cent., compared with bran 9.9 per cent. P.E., and 44 per cent. S.E., and oaten hay 3.5 per cent. P.E., and 42 per cent. S.E. Lucerne hay, therefore, contains nearly as much available protein as bran, and $2\frac{1}{2}$ times as much as oaten hay, but its total food value or starch equivalent is about one-sixth lower.

Good, green, leafy lucerne hay retains many of the desirable qualities of green lucerne, and for this reason it is recommended to replace green stuff, when unavailable, in rations for poultry and pigs.

For the supplementary drought feeding of sheep, a mixture of grain and lucerne hay has been found to provide one of the best and cheapest rations. With the use of molasses, it is possible to compound nuts containing four parts lucerne hay, four parts grain, and two parts molasses. These nuts make a properly balanced ration, and are compact and suitable for long haulage to outback sheep.

The value of lucerne hay for cattle feeding is undoubted, and if it were more universally used as the roughage displacing oaten and

meadow hay for supplementary feeding, butter-fat production could be increased greatly. After the pastures dry off the majority of dairy cows receive too little protein, and for this reason alone lucerne hay it worth its place as a protein-rich roughage on the dairy farm. Most other protein-rich foodstuffs, such as meat meal, peanut meal, linseed meal, &c., are relatively scarce and difficult to obtain when most needed.

Used by itself, lucerne does not make the best silage, but from mixtures of lucerne and maize or lucerne and oats, or by wilting the lucerne to dry off the surplus moisture, and then sprinkling it with molasses, whey, or a mixture of both, good silage can be made. Another method of making good silage from lucerne is to add ground maize, ground barley, or ground wheat. From 50 to 100 lb. of ground maize, barley, or wheat is required, together with about 35 lb. of molasses per ton of lucerne. However, lucerne hay is preferable to lucerne silage.

Lucerne will not grow in every district, but in localities favorable to its growth one paddock of lucerne should be maintained on the farm. There is always a demand for surplus lucerne hay at good prices, and during drought times very high prices may be obtained.

Sheep.

Except for supplementary hand-feeding in the dry areas, the present is not a very busy time for the sheep owner. However, all undipped sheep should be dipped immediately, and ewes and lambs mated for lambing to commence toward the end of June. The British breeds are usually mated now. If mated earlier, the ewes are very slow at taking the rams, bringing about a very straggly lambing period.

Dairy Cows.

The length of time a cow should be rested between one lactation and another, so that she may acquire sufficient reserves of energy, protein, and minerals in her body for the unborn calf, the function of calving and the following lactation period will depend largely upon how well the cow has been treated during the closing lactation and how well she is treated while dry.

A perusal of the records kept at the State Research Farm, Werribee, for the years 1928 to 1939, inclusive, reveals that Red Poll cows require a dry period of about six weeks, and Friesians about three weeks for best production performances. Shorter dry periods have not reduced butter-fat yields greatly, whereas long dry periods have tended to lower yields.

Messrs. T. M. Noble and Sons' "Selsey Fernleaf II.", winner of 1st prize as a 3-year-old at Traralgon Agricultural Show, 1940. This cow produced 392 lb. butter-fat as a 2-year-old.

Lower and irregular performances following the longer dry periods are in some cases attributable to lower-producing cows prematurely drying themselves off, and thereby receiving longer dry periods, and also to the fact that the dry cows sometimes receive less generous treatment as dry cows than as milkers. This practice cannot always be avoided, but steps should be taken to make adequate provision for the dry stock during the winter and other lean periods. The total production from the lower-producing cows can be raised considerably by mating them to re-calve earlier each year.

A rest or dry period of three to six weeks is sufficient for cows adequately fed and properly cared for.

Pigs.

As a substitute for separated milk to balance grain and other foods for pigs, meat meal gives better results, when used in combination with other protein-rich foods and minerals than when fed alone.

When separated milk is not available, the following mixture is recommended:—

Meat meal	50 lb.
Linseed meal, peanut meal, or rape meal	20 lb.
Lucerne chaff	20 lb.
Ground limestone ..	8 lb.
Common salt	2 lb.

This mixture should be fed at the rate of ½ lb. per pig daily from weaning to baconer weight and for brood sows, and 1 lb. daily for sows rearing litters. These quantities are sufficient to balance all the grain that the pigs can eat.

When good pasture or ample green food is available, the above quantity can be reduced by half.

Where grain has to be purchased, pasture, forage and root crops, pumpkins, waste fruit, and kitchen refuse should be used to the fullest extent to reduce feeding costs, but some grain should be included in the ration, particularly for younger pigs.—(L. A. Downey, H.D.A., Pig Expert.)

VETERINARY NOTES.

Black Spot of the Udder.

At times much trouble is occasioned in herds by a condition of the udder known commonly as Black Spot.

This condition is an infection of the secretion at the orifice of heifers' teats, and as a rule it takes place before calving. When milk secretion commences the infection flares up and a solid scab-like plug obstructs the orifice, and despite treatment, extension usually occurs in the udder tissue. The majority of animals so affected become useless for dairying purposes.

Immersion of the teats daily for a fortnight prior to calving in a solution of sodium hypochlorite—1 ounce in 4 gallons of water—is suggested for the prevention of the trouble.

When the ulcers appear, the teats should be washed with a warm antiseptic solution. Gently remove the scabs, dry the part thoroughly, and dress the ulcers with an ointment containing one part of copper sulphate (bluestone) finely powdered and thoroughly incorporated in nine parts of vaseline. The milk from the affected animal is not fit for human consumption.

Botulism in Horses.

With the present increased demands for horses for farm work, it is regrettable that more horses than usual are dying this season from that preventable disease "botulism," otherwise known as "forage poisoning." Cattle, also, are subject to this disease perhaps to a greater extent than horses.

Nature and Cause.

The disease is a food poisoning resulting when animals eat fodder containing the toxin or poison produced by a certain microbe (*Clostridium botulinum*), which grows and multiplies in decomposing fodder, or in the carcasses and bones of animals and birds: that is, the microbes attack dead tissue only, and it is the poison produced in this dead tissue that, if ingested with the food, produces the disease. Botulism is not infectious nor contagious, it is not transferred from one live animal to another, nor is it necessary for the germs to enter the living animal. The toxin, which is soluble in water, is one of the most powerful poisons known. In common with other bacterial poisons it produces its effects only after a definite interval, which is from three to seven days.

Sources of Causal Organism.

Sources of the causal organism and its toxin are as follows:—

(1) Hay, chaff, or grain damaged by water, and probably mouldy.

(2) Fodder contaminated by mice.

(3) Fodder in mangers contaminated by dust or water percolating from old straw-covered stables.

(4) Old grass paddocks of a tussocky nature, or long stubble trampled into a mat.

(5) Butts of stacks; cocky chaff left in paddocks after harvesting.

(6) Manure or manure-contaminated fodder, especially fowl manure.

Colt showing signs of irregular gait due to botulism.
[After Seddon.

(7) Water polluted by stable drainage.

(8) In the case of cattle, where mineral deficiency exists, old bones and carcasses are particularly dangerous if chewed. They should be collected and burned, and not left lying on the pastures.

Symptoms.

The symptoms of botulism vary somewhat, but in general they are marked by paralysis of the various muscles. The animal becomes dull and listless and there are irregularities in its gait; it may knuckle over and stumble as it moves along. The eye is noticeably dull and the eyelids often partially closed, and the head appears to be "heavy." In many cases there is interference with the functions of eating and mastication, strings of saliva and wisps of fodder may be seen hanging from the mouth.

Later the paralysis of the various muscles increases, and the animal becomes prostrate, often showing a paddling movement of the limbs while in such a position. Acute cases sink into a semi-comatose condition, and death takes place in a few hours. In those cases in which the patient eats and drinks, the disease will run a chronic course over a period up to several weeks if slinging be carried out. Even then, however, a favorable prognosis can rarely be given.

As botulism has a very high mortality rate, and few affected animals recover, prevention of the disease must be aimed at.

Control Measures.

In discussing this disease, the old maxim which states that "prevention is better than cure," is particularly apt. If sound fodder only be used and if precautions are taken to prevent contamination by mice or with manure, botulism cases will be unlikely to occur; therefore, it is necessary to take every precaution to protect hay, chaff, and grain from damage by rain or by mice.

Poultry should be kept out of the stables and fodder barns, which latter should also be, as near as possible, mouse-proof.

All straw-roofed stables should be inspected. Those beyond repair should be pulled down. In all cases it would be advisable to line the roof immediately above the mangers with galvanized iron to prevent water and dust from falling.

Damaged hay—tops and bases of stacks—decomposed cocky chaff, and other like material should not be allowed to collect around the stable yard.

Care should be taken to ensure a pure water supply for all stock.

Pamphlets dealing fully with botulism in horses and in cattle and also with impaction paralysis are available free on application to the Director, Department of Agriculture, Melbourne, C.2.

Owners who are experiencing losses in their stock from these diseases should communicate with the Chief Veterinary Inspector, Department of Agriculture, Melbourne, when advice regarding control measures, &c., will be given immediately.—(W. D. Shew, G.M.V.C., B.V.Sc., Senior Veterinary Officer.)

Poultry Farming.

Summer Management.

During the summer months every care and attention must be given to the birds, in order to avoid undue loss from heat apoplexy, and to obtain the maximum number of eggs. In this connexion it is important that there should be ample room in the laying houses, as overcrowding causes the birds to become overheated. A house 20 feet square, 8 feet high in the front, and 6 feet at the back, with a 6-in. opening along the back under the roof, will allow of good ventilation and provide sufficient room for 100 birds. Plenty of nests inside the houses are essential, and careful consideration should be given to their ventilation, so that the birds will be able to keep as cool as possible during laying.

Feeding on correct lines is necessary at all periods of the year. A suitable combination of good clean and wholesome foods, sufficient for the birds' requirements, is essential to prevent them from becoming lowered in vigour. It should be a rule never to feed any unclean or decomposing foods. There are many kinds of green food that may be fed, and it is important that the birds should be provided with a continuous daily supply.

A most important consideration is the provision of a constant and plentiful supply of fresh cool drinking water, which must be easily accessible to the birds. Water vessels that may be reached by the birds under normal weather conditions are sometimes found to be

[Continued on page 42.

Fruit Drying for Home Use

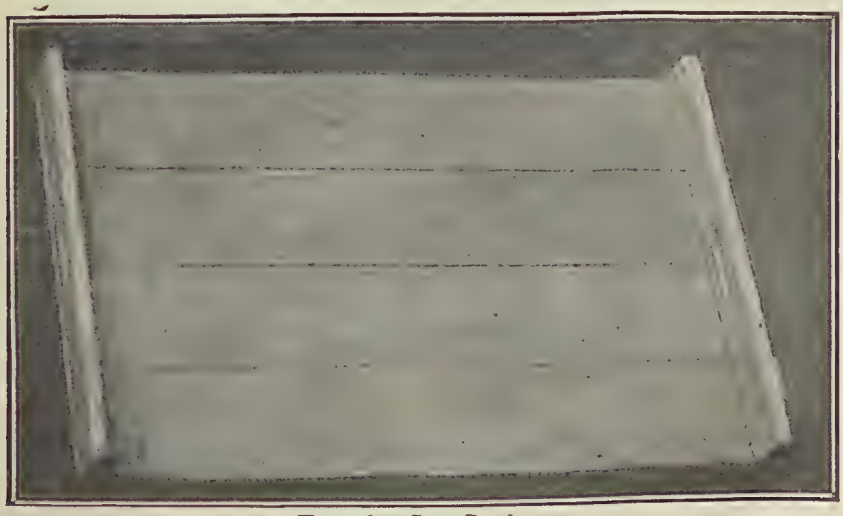
By Miss A. Knight

THE drying of fruit or vegetables for home use requires no expensive outlay for utensils, &c. The general principle involved is the removal by evaporation, without injury to the fruit, of sufficient moisture to ensure its preservation. This moisture may be driven off by exposing the fruit to the sun's rays, the wind also playing a part, or else by artificial heat.

For sun-drying purposes, either the rack system or trays may be used. The former method requires a wooden rack of suitable width and height, with cross-pieces at convenient distances, over each tier of which are stretched sheets of hessian, and the prepared fruit is left thereon until sufficiently dried. This system is generally used, however, when treating fruits in large quantities only.

Trays of a convenient size for the purpose may be made by joining together four 6-in. x ½-in. lining boards 36 inches long, and nailing to them at each end a cleat 2 feet long by 1 inch wide and 2 inches deep, making the finished tray 36 inches x 24 inches; but, whatever measurements are decided upon, these should, for convenience in handling and stacking, be of uniform size.

Fairly effective drying may be done indoors, either in an oven with the oven door partly open, or preferably by a small "home evaporator." The evaporator should be of a size that will fit on a range or in a fireplace, and it should be fitted with wire trays placed as shelves. It may be either suspended over, stood on, or even hung in the vicinity of, the kitchen range where currents of heated air will pass over and about the product, gathering the moisture and carrying it away. One measuring 24 inches high by 24 inches wide and 18 inches deep should be found a useful size.



Tray for Sun-Drying.

The material required for the frame would be—

Four corner uprights, 26 inches x 1½ inch x ⅞ inch.

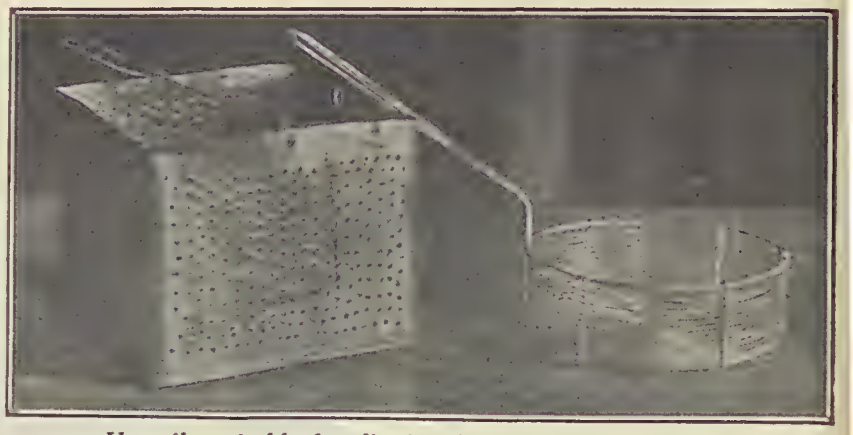
Four end pieces (two for each end of frame), 18 inches x 1½ inch x ⅞ inch.

Four pieces (two each for back and front), 24 inches x 1½ inch x ⅞ inch.

Sixteen tray rests (eight for each side), 18 inches x 1 inch x 1 inch.

Trays for the above may be made by first making a frame of two pieces of 22 inches x 1 inch x 1 inch and two of 18 inches x 1 inch x inch, and then tacking to this a square of wire gauze, fastening it on more securely with narrow laths.

To suspend the evaporator, a wire may be fastened to each top corner, and the four wires made to meet in a centre ring. If this method be impracticable in any place, the way that convenience dictates may be followed. If stood on the stove, four supports or feet should be placed underneath the evaporator, so as to lift it high enough to prevent burning.



Utensils suitable for dipping fruit in the lye solution.

Preparation for Drying.

Some varieties that are dried whole, including grapes, prunes, figs, &c., are usually dipped for a few seconds in a boiling solution of lye, which cuts the bloom and causes minute cracks to open on the surface of the skin, through which the moisture escapes more readily than if the fruit were not dipped, thus hastening the drying process.

Dipping the Fruit.—The lye solution is made by dissolving 1 lb. of caustic soda in 16 to 20 gallons of water, the strength varying according to the kind of fruit under treatment. If used too strong, or the fruit left too long in the solution, the skin will probably burst, making the finished product less presentable, and liable to sugar more quickly.

It would be advisable for the operator to experiment with several small lots by immersing the first for from ten to fifteen seconds, and if, on examination, the skin remains intact, fresh specimens should be steeped for three or four seconds longer, or, if overdone, then for a few seconds less. The cracks or checks in the skin should be no larger than would be just visible to the naked eye. The fruit should be rinsed by passing it through a clear cold-water bath after it comes from the dipping solution.

An ordinary household washing copper would serve as a dipping vat. A wire basket or perforated cage will be necessary to hold the fruit during the dipping operation; a large billy or petrol tin cut down and well perforated over both bottom and sides, and fitted with a strong wire handle, will serve the purpose; the perforation should be done from the inside, with a hammer and large nail, so as to avoid any roughness which would tear the flesh of the fruit.

Sulphuring.

All light-coloured fruits have a tendency during the drying process to darken in colour. To prevent this and make the product more attractive, they are usually sulphured. This process is carried out by placing the trays of fruit in a box of a length and width to admit the trays being slipped in or out readily, and of a height to suit requirements, on the sides of which should be fastened cleats 3 or 4 inches apart for tray rests. The fruit is then placed in the cabinet and enveloped with fumes of the burning sulphur.

The amount of sulphur used is approximately in the proportion of 1 lb. to every 100 cubic feet, but depending somewhat on the length of process. The sulphur should be put in a suitable receptacle, placed on the floor of the box, and ignited by a few live coals or other method, the box or cabinet then closed, and the fruit subjected to the fumes for a length of time depending upon the kind of fruit being treated. When sufficiently sulphured, it is then ready for drying.

Sulphured fruits appear to dry more quickly and with a better texture than the unsulphured, and the process is also thought to give them a certain amount of protection against injury from insects while exposed for drying. If the fruit is for home use, this operation

may be omitted altogether, but if for commercial purposes it will be necessary, as the sulphured product is very much more attractive than the unsulphured.

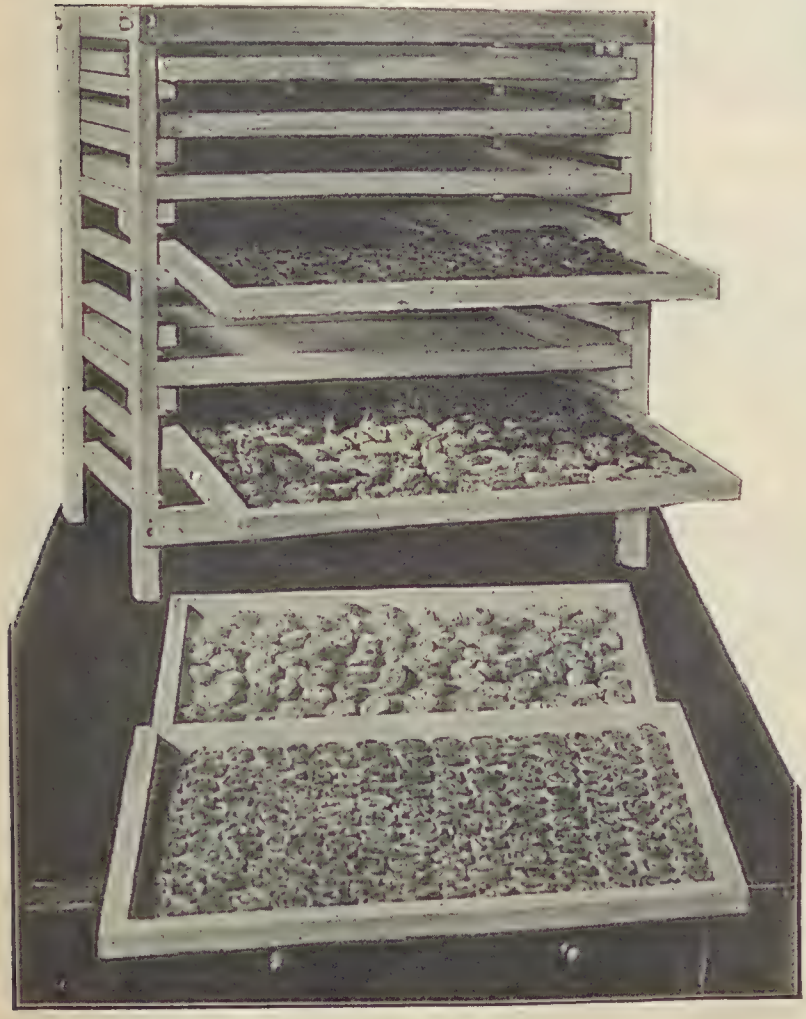
Drying.

The length of time required for drying varies with the different fruits, sizes of pieces, temperature, weather conditions, and other influences. If there be any dew or rain, the trays should be stacked one over another, and a cover thrown over the whole as a protection from dampness.

All fruit should be equally dried before packing. To effect this it should be removed from the trays and placed in bins or heaps, so that the overdried specimens may absorb surplus moisture from those not quite dry enough, and thus condition or equalize the whole.

Apricots.

Apricots for drying should be ripe, but not "mushy." They may be dried whole, but usually are cut in halves. The fruit is placed on the drying trays with the cut sides uppermost, and then put in the sulphur-box without unnecessary delay, and sulphured. The length of time allowed for sulphuring differs widely; some give four or five hours, while others allow fruit to remain all night, during which time the fumes gradually die out; therefore, anything from one to twelve hours may be given.



A Home Dryer.

Some determine the time for removing the fruit from the sulphur cabinet by its appearance; this is often known by the depression, from whence the stone has been removed, filling with juice. The trays should then be carefully removed and placed in a suitable position for drying. If they are raised a little from the ground they will dry better than if they are placed flat on the grass.

The period required for drying will largely depend on weather conditions, &c., varying from two and a half to four days, in a few cases even longer.

All pieces of fruit on the one tray do not look alike, and some of the pieces must be collected from the trays sooner than others. Each tray must be examined occasionally, and those pieces sufficiently dry, removed. The appearance and texture of the fruit will be a guide as to whether the drying process has continued long enough. When sufficiently dry, the pieces should be somewhat pliable, yet, when twisted about between the fingers, have no sign of juice nor be in any way mushy. When that stage is reached they are ready to be "conditioned."

Apples.

Any variety of apple may be used, though cooking apples are best and white-fleshed sorts, when dried, are the most presentable. They should be fully matured, but not "floury" or "mealy." The apples are usually peeled, cored, and sliced, but are sometimes dried whole with only the core removed. During preparation, the peeled fruit is sometimes dropped into a weak salt solution (about two tablespoonfuls of salt to 1 gallon of water) to prevent its discolouring, but it should not be allowed to remain too long in this bath, certainly not after the required quantity is prepared.

It is then sulphured for a few minutes and dried until the slices or rings are soft and velvety to the touch, and of a pliable texture. Another way of judging is to take a handful of the slices, close the hand tightly, pressing the fruit firmly into a ball in the palm of the hand, and, if sufficiently dry, the rings or slices should be springy enough to separate at once on being released; they will then be ready for removal.

Pears.

The Williams Bon Chretien pears are a good drying variety. The fruit may be skinned or not; it is usually halved, spread on trays with the cut side uppermost, and well sulphured, after which the pieces will be quite soft and require careful handling. They are then ready for drying. When sufficiently dry, they should be of a somewhat doughy, stretchy texture, if worked between the fingers.

Peaches.

The yellow, firm-fleshed, free-stone varieties are the best for drying. They are treated in almost the same way as apricots, and the finished article is also tested in the same manner. Peaches, however, usually require a longer time to dry than apricots.

Prunes.

Dark-coloured plums do not need sulphuring, but light-coloured varieties are improved by it. They are selected when fully ripe, and treated with a soda dip as before described, then spread to dry. When finished, they should have a shrunken skin, and the texture should be firm, springy, and pliable if pressed in the hand.

Prunes are improved if glossed. This is done by immersing them (immediately before packing) for a few seconds in a boiling, but weak solution of either glycerine and water, one part glycerine to sixteen parts water, or sugar and water, and then throwing them in a heap, preferably in a dark place, and covering with a cloth for, say, 24 hours, by which time the outside moisture is absorbed. They will then be ready for packing.

Grapes.

Lexias (Pudding Raisins).—Ripe "Gordo" grapes are usually selected. They should be immersed for a few seconds in the soda solution and then spread on trays for drying.

Sultanas are treated in a similar way to lexias.

Currants.

The bunches should be cut from the vine. They do not require to be dipped. They are placed on the drying trays and exposed to a moderate temperature for drying; where the bunches are thick at the shoulders, the branchlets forming this portion should be opened or spread, so as to avoid dense masses. Where convenient, it is preferable to expose currants to a gentle hot wind without the full glare of the strong sunlight.

Muscatel or Dessert Raisins.

The grapes should not be removed from the stem. They must not be dipped. They should be carefully handled during the picking, drying, and packing, as the retention of the colour and bloom upon the fruit is of importance.

Cherries.

Cherries may also be dried and used as a substitute for raisins. They are sometimes dried whole, but more frequently stoned.

Figs.

Select ripe figs, the riper they are the better will be the flavour. Steep in lye solution as described for raisins, then sulphur and dry. When dried, to prevent their becoming unduly hard, and also to destroy insect life, it is considered advisable, before packing, to dip them for several seconds in a boiling solution of rocksalt and water (about 3 oz. of salt to a gallon of water), and then place in a heap for a few hours. The salt also has the advantage of counteracting the excessive sweetness of the fig. If tasted soon after steeping, the product may have a salty taste, but in a few days this will be quite unnoticeable.

Artificial Fertilizers Registered for 1941

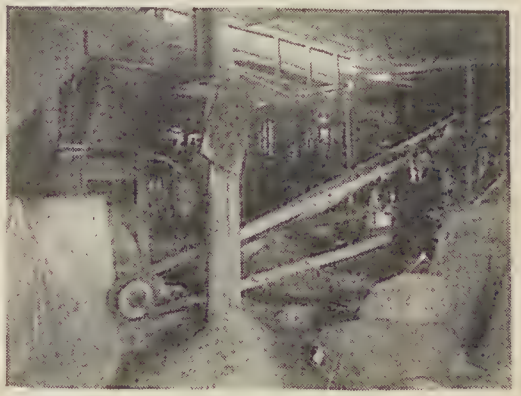
Registrations and Unit Values

By W. C. Robertson, Chemist

UNDER the Fertilizers Act a new season commences in the first week of December of each year when the main annual list of registered brands is published in the *Government Gazette* as required under section 21 of the Act. Further, section 27 provides that unit values be calculated for the constituents which have a commercial value, the percentages of which are set out in all applications for brand registration. The unit values so calculated are published with the main list of registered brands.

The list remains in force until the next list is published in the following year, and the unit values constitute the basis for calculating the values of all fertilizers for the period the registered brands continue in force.

It is sometimes assumed that the acceptance of a registered brand of fertilizer by the Director of Agriculture and its subsequent appearance in the published list means that the fertilizer is sold in the pure and unadulterated condition, and also that its use is recommended by the Department. This is not the case, however. The unit values are purely commercial, and are calculated from the analytical figures and the prices per ton supplied by the manufacturers when applying for the registration of a brand or brands. They bear little relation to the agricultural value of the fertilizing constituents, and the fact that a brand is registered simply means the manufacturer has thus far complied with the law. No brand can be registered without the approval of the Director of Agriculture, but providing the fertilizer guarantee shows reasonable value when calculated by the unit value system, and the figures showing the results of a chemical analysis are sufficiently high to prove a definite concentration of plant food, and the brand is not substantially identical with any brand already registered or proposed to be registered, or so nearly resembles it as to be likely to deceive the purchaser, there is little likelihood of approval being withheld, providing that the application complies with the requirements of the Act in all other respects.



A country fertilizer works.

Unit values as plotted under the Fertilizers Act are useful only for calculating the values of similar fertilizers or their mixtures, and for obtaining comparative values as between brands of the one class of fertilizer.

In using the unit value system for fertilizers, it should be remembered that values can be calculated only where the constituents have a unit value. The form of the fertilizing constituent and its unit value must not be confused or applied incorrectly. For example, in calculating the value of castor meal or wool waste by multiplying the nitrogen percentage by the unit value of nitrogen in the form of nitrate or blood.

The commercial value per ton of the principal fertilizers, i.e., superphosphate, sulphate of ammonia, sodium nitrate, dried blood, bone dust, potassium sulphate, and potassium chloride can be calculated readily by the system which is to multiply the percentage of the fertilizing constituent by the correct unit value.

For example, two brands of dried blood—A and B—are certified to contain 13 and 12 per cent. of nitrogen, as blood, respectively. To find the value of Brand A, 13 per cent.

at 19s. 11d. per cent. equals £12 18s. 11d., which is the value per ton. Similarly Brand B, containing 12 per cent. of nitrogen, as blood, at the unit value of 19s. 11d. per cent., gives a value of £11 19s. per ton. As the price asked per ton was £12 10s. for Brand A, having a calculated value of £12 18s. 11d., and £10 for Brand B, with a calculated value of £11 19s., the use of the system in this particular instance was well worth while, for it shows Brand B to be worth £1 19s. more per ton than the price the manufacturer is prepared to accept, whereas Brand A shows an excess value of 8s. 11d. per ton over the price asked. The purchase of Brand B, therefore, results in a net saving of approximately 30s. per ton.

The list of 147 registered brands for the 1941 season (see supplement to this *Journal*) compares with 162 brands registered in the main list for the year 1940, or a decrease of 9.3 per cent. in the number of brands registered.

The decrease is due to the difficulty in obtaining from overseas supplies of certain fertilizers which are used extensively in fertilizer mixtures, and also to the scarcity of raw material for the manufacture of animal fertilizers.

A noteworthy feature is the appearance of fertilizers and mixtures containing treated leather and hoof, but of more importance is the marked increase in the price per ton of certain fertilizers and the consequential alterations in their unit values. In this respect, while the unit value for nitrogen in the organic form in blood and in bonedust remains unaltered, the increase in nitrate nitrogen in the imported fertilizer nitrate of soda amounts to 10.6 per cent. (17s. 4d. to 19s. 2d.), and the rise in the price of sulphate of ammonia has increased the unit value by 31.1 per cent. (12s. 4d. to 16s. 2d.).

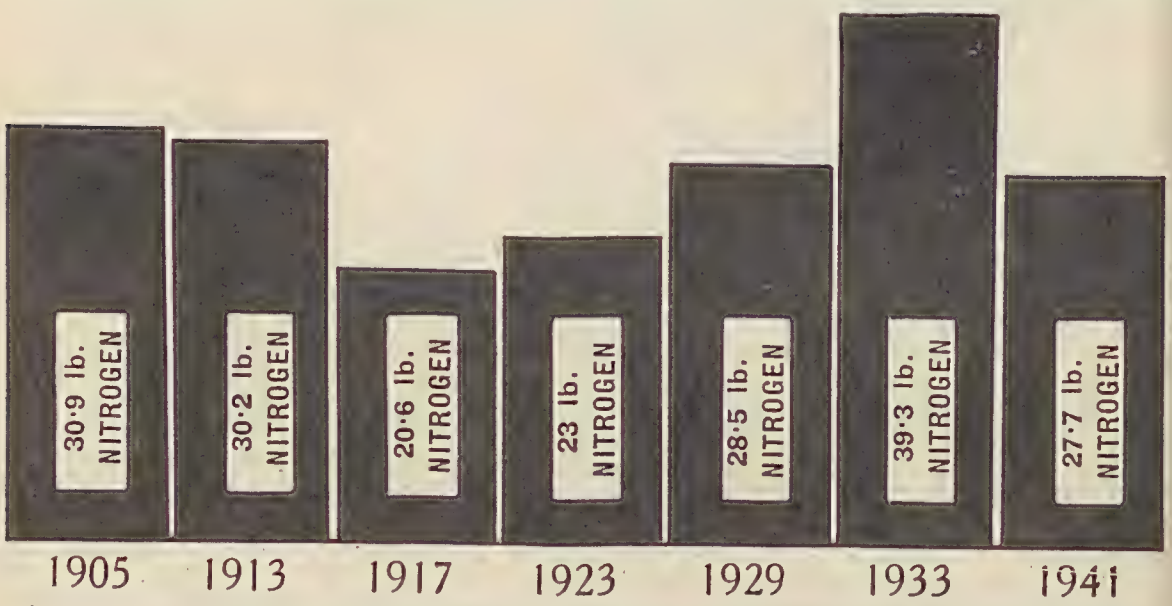
The increase in the unit values of fertilizers is a serious matter for agriculturists, particularly in the case of phosphoric acid in phosphatic fertilizers.

The unit value of water soluble phosphoric acid has increased by 30.2 per cent. (3s. 7d. to 4s. 8d.), while the citrate soluble form in the same fertilizers shows an increase of 33.3 per cent. (3s. to 4s.).

The unit of citrate insoluble phosphoric acid in ground rock phosphate has gone from 2s. 2d. to 2s. 10d., a rise of 30.8 per cent., while the unit value for phosphoric acid in bone has increased by 7.8 per cent.

Potash in the form of chloride shows an increase of 30 per cent. in the value of 1 per cent. per ton (5s. 4d. to 6s. 11d.). The increase in the sulphate unit is a little lower at 26.3 per cent. (6s. 4d. to 8s.).

Potash salts are in such short supply that sulphate has been practically withdrawn from sale and existing stocks of chloride with the



Graph 1 illustrates the number of pounds of nitrogen received for every 20 shillings expended on sulphate of ammonia during the years shown.

small consignments coming forward are being used in the preparation of mixed and complete fertilizers or for limited rationing.

Graph 1 (page 26) indicates price variations of sulphate of ammonia over a period of years.

The number of pounds of nitrogen as sulphate of ammonia obtainable for 20s. for the period 1905-41, which includes the early days of artificial manuring, is shown in the Graph. It will be noted that this fertilizer was comparatively cheap in the early years of the present century when nitrogenous manuring was not extensively practised, and approximately 31 lb. of nitrogen could be obtained for 20s.

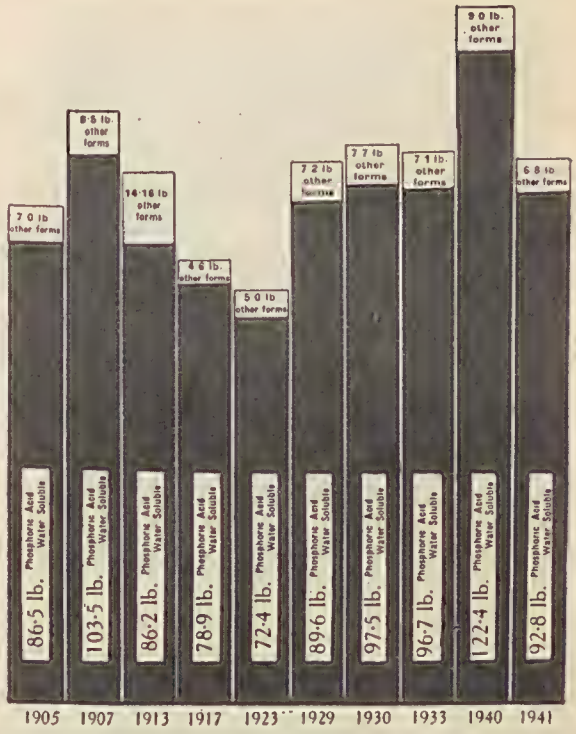
During the seasons 1914 to 1918 the price of sulphate of ammonia increased until in 1917 the sum of 20s. purchased 20.6 lb. of ammoniacal nitrogen. A decrease in the price of the fertilizer resulted in this figure being increased to 23 lb. in 1923. When the synthetic salt came on the market in 1929 the number of pounds increased to 28.5, and in the year 1933 the price of sulphate of ammonia dropped so low that 39.3 lb. of nitrogen as sulphate of ammonia could be purchased for 20s.

After a year of the present war the quantity obtainable for the same money fell to 27.7 lb., which means that the fertilizer is not as dear, although it may be as scarce, as it was at the end of the Great War, but the end of the present war is not yet.

Graph 2 relates to the price of superphosphate. In the years 1905-1907, when superphosphate was much inferor in composition to that sold to-day, the decrease in price, which is shown in the graph, was due to competition by a new manufacturer and importations of superphosphate from Germany, Belgium, and Japan.

The quality of ordinary superphosphate at this time was 17/20, i.e., 17 per cent. of water soluble phosphoric acid with a total percentage of 20 against the present high grade "super.," which has a guaranteed content of 20.5 and 22 per cent. respectively.

Immediately prior to the 1914-1918 war the price of "super." was steady, 86.2 lb. of water soluble phosphoric acid being obtainable for 20s. After three years of war this figure was reduced to 78.9 lb. By 1923 it had fallen



Graph 2 illustrates the number of pounds of phosphoric acid received for every 20 shillings expended on superphosphate during the years shown.

to 72.4 lb. From then until 1929 the price of the fertilizer remained fairly stationary, when competition and other factors decreased the price to such an extent that 89.6 lb. of phosphoric acid in the water soluble form could be procured for 20s. From 1935 onwards a marked decrease in the price of raw material and other factors further reduced the price until in the early months of 1940, 122.4 lb. of water soluble phosphoric acid could be purchased for 20s.

During 1940 the price of superphosphate was fixed by the Prices Commission, and the increase in price has resulted in a fall to 92.8 lb. of water-soluble phosphoric acid for every £1 expended. Providing no further increase in price is deemed necessary the farmer is approximately 18 per cent. better off than he was at the end of the last war, in so far as the price of phosphoric acid is concerned.

Potassium sulphate is in very short supply, and potassium chloride obtainable only on a firm rationing basis at a fixed price.

Chick Sexing

Results of Examination

By H. F. Clinton, F.R.M.S., F.B.S.A., Poultry Expert

AN examination in chick sexing was conducted by the Department of Agriculture, at the Burnley School of Primary Agriculture and Horticulture, on the 18th October, 1940, in order to provide an opportunity for persons wishing to qualify for a Special or a First Class Government Certificate. This was the third annual examination conducted by the Department, the intention being to hold a similar examination each year.

Candidates for a Special Certificate are required to sex 300 White Leghorn chickens in 45 minutes, with an accuracy of 98 per cent., without killing or injuring a chicken. Those sitting for a First Class Certificate are required to sex 200 White Leghorn chickens in 30 minutes, with an accuracy of 95 per cent., without killing or injuring a chicken.

Three candidates presented themselves for this examination—two for a Special Certificate, and one for a First Class Certificate. Of the total number of three candidates, two again qualified for First Class Certificates for the first 200 chickens sexed.

A complete list of holders of chick sexing certificates issued by the Department up to date is shown at the conclusion of this article.

Methods of Sexing.

For many years attempts have been made to determine the sex of the future chicken in the egg, but up to the present it appears that no reliability can be placed on any of the methods suggested.

Investigators have concentrated also on an endeavour to find a practical method of distinguishing the sex of chickens at the time of hatching, and a high degree of success has been achieved by two methods which are now used commercially.

One method is known as sex-linkage, a term which implies the possibility of distinguishing the sex of day-old chicks, which are the result of the first crossing of two pure breeds, by their colour and in other ways. For example, if a Rhode Island Red male is mated to a light Sussex female, the male chicks will be white or yellow, and the females a warm buff or brown. Quite a number of crosses may be made with different breeds.

Sex Linkage.

[Feathered World.

Lower left: Female chickens following the color of the male parent (Rhode Island Red) and lower right, male chickens following the color of the female parent (Light Sussex). The two top birds are the parents and the two centre ones are the grown chickens.

In one true-breeding race of fowls, the Cambar, there is no need to cross for the production of a sex-linked result. The Cambar is a light breed, developed by Professor Punnet of Cambridge University who, with Professor Bateson, was first in the field regarding the discovery of sex-linkage in poultry. In

appearance the Cambar much resembles a "Campine," and is, in fact, descended from Gold Campines crossed with Barred Rocks.

The main point in connexion with the Cambar is that it possesses the quality of sex-linkage within itself, no further crossing being necessary. Thus the male day-olds are of a pale grey shade striped with brown, while the females are much darker in their brown colouring, with only a few streaks of white or grey here and there. The Cambar was exhibited for the first time at the World's Poultry Congress at the Crystal Palace, in 1930. Quite recently other varieties have been developed along similar lines.

The White Leghorn, however, could not be used for sex-linkage purposes, except, perhaps, when crossed with some heavy breed—one a quick feathering and the other a slow feathering breed—and the sex of the chicks identified by the length or quickness of growth of the wing feathers, for fast and slow feathering, it is claimed, is sex-linked. It has been stated also, that it may be possible to establish two strains of White Leghorns, using the principle of quick and slow wing feathering as a basis, and the sex of the chickens distinguished at a day old. The sex of White Leghorns cannot be determined unfailingly by any casual observation until the birds are about four to six weeks old.

The White Leghorn, which is kept in large numbers for egg production in many parts of the world, has not been used for sex-linked purposes, and a method of sexing day-old chicks of this variety, which has come into general use, and can be used also with any other breed, is by the presence, size, appearance or absence of a rudimentary organ on the ventral rim of the cloaca. As may be imagined, this method of sexing is a very delicate and skilled operation, requiring keen eyesight, and a suppleness and delicacy of touch not found in every individual. The details of the process take a long while to learn, and considerable practice is required before a high rate of speed and efficiency can be reached. This method was used by the candidates at the chick-sexing examinations conducted by the Department of Agriculture.

Many poultry farmers prefer to have the sexes separated at the time of hatching, as the cockerels then can be disposed of immediately, or kept by themselves, to be sold later for table purposes. The pullets are reared separately for the more profitable branch of egg production under ideal conditions necessary for their development.

A chick-sexer at work.

It is pointed out that sexing day-old ducklings or goslings by means of the presence or absence of the male copulatory organ has not presented any difficulty at all, and the knowledge required for this purpose may be acquired quickly.

Mechanical Indicators.

Quite a number of claims have been submitted to the Department from time to time, over a long period of years, that a means of determining the sex of the future chicken in the egg had been discovered. In some cases the confidence and enthusiasm of the claimants were so marked, and appeals that the method should be given a trial were so earnest and persistent, that practical tests were actually made.

One of the first devices for determining the sex of the future chicken in the egg, that caused much excitement in the poultry world of Victoria, probably 35 years ago, was known under the various names of Sex Detector, Sex Indicator, Egg Indicator, Genderometer, &c. It is quite possible that thousands of these instruments have been sold throughout the world.

Many authorities have carried out tests with these detectors, and the results were not in accordance with the claims made for them. The writer has tested them on eggs known to

be infertile, and also on boiled eggs. In all cases the apparatus moved in one way or the other, indicating (according to the instructions supplied) that the egg was capable of producing a chick. These adverse experiments, together with the fact that, after all these years, the sex indicators have not come into practical use, show that this method of determining the sex of the future chicken in the egg is of no use to the poultry-keeper whatever.

Shape and Size of Egg.

A belief that has persisted is that the long oval-shaped egg will hatch out a cockerel, and the short oval egg a pullet. At various lectures on poultry keeping throughout Victoria this belief has been referred to from time to time by members of the audiences, but so far as the writer of this article is aware there have never been any definite results obtained to support the theory.

Many claims have been made that peculiarities of the shell or of the contents of an egg indicate the sex of the chick that could be hatched from it, but the claims have never been substantiated.

A large egg may produce either a male or female chick, and the same may be said of small eggs. Crew (1925) states:—

> "In the case of the dove and the pigeon, Riddle finds that those eggs which yield females are large and contain more food material for the embryo than those which become males. The size difference is small, however, and the "large" eggs and the "small" eggs vary in size; there is overlapping of the curves when the size is plotted in a graph, and for this reason it is impossible to predict, from the size of the egg alone, the sex of the future bird."

Determination of Sex.

It has been established that, in the higher animals at least, the sex of the individual is decided at the time of the fertilization.

In mammals and in most insects the male produces two kinds of sperms, differing in their chromosomes, one capable of producing a male and the other a female. But in the female all the eggs are alike in regard to their chromosomes, and therefore have no influence on the sex of the future embryo. The resulting sex in these animals is, therefore, dependent upon the particular kind of male sperm entering the egg at the time of fertilization. In birds, butterflies, and moths, the position is reversed, the female producing two kinds of eggs differing in their chromosomes, and the male one kind of sperm; so that in the domestic fowl it is the egg that determines the sex of the future chick, some of the eggs having the male determining factor, and some the female determiner.

Theoretically one should then be able to tell the sex of the future chicken by means of a microscopical examination of the chromosomes in the fertilized egg. Practically, however, this is not to be considered, as to do this would mean the destruction of the egg.

With reference to the embryology of the chick, Marshall (1893) states:—

> "During the eighteenth century, facts accumulated rapidly, but the theories quite outpaced them, and the current doctrine throughout the century, supported by many, and, notably, by Haller, was that of preformation, according to which the chick was stated to be present in the egg at the time it is laid, all its parts and organs being there from the beginning, but in an extremely minute and unexpanded condition, the development of the embryo being regarded as a process comparable to the unfolding and enlargement of the several parts of a bud to form the perfect flower."

But with the development of the study of embryology and microscopical research, it was found that the first conspicuous structural feature to make its appearance in the embryo after the laying of the egg and during incubation is the primitive streak. In eggs that have been incubated about sixteen hours the primitive streak, as seen under the microscope, is well developed as a linear groove flanked on either side by ridge thickening. It is during the following days of incubation that the embryo gradually takes form. By careful dissection, it is found that it is not until the fifth and sometimes the sixth day of incubation that the first indications of the sexual organs become recognizable.

Attempts to Control Sex.

Attempts have been made to control the sex by methods of feeding, special matings, &c. In practice, on a large commercial scale, these

[*Continued on page 38.*

By J. L. Provan, B.Agr.Sc., Senior Horticultural Instructor.

Orchard Notes.

IT is probable that there will be a shortage of fruit packers throughout Victoria during the current season. The Department of Agriculture is attempting to meet this situation by the formation of packing classes in each of the principal apple and pear-growing districts. These classes will each be of a week's duration, and applications are being invited from persons who desire to learn this work. There is no charge for tuition, and material will be provided. Applicants should forward their names and addresses to the Director, Department of Agriculture, Treasury Gardens, Melbourne, C.2, and state whether they have had any previous fruit packing experience.

Ethylene colouring chambers for citrus fruits, and also cool stores, frequently become contaminated with mould spores. In some cases, the walls of these buildings become a mass of mould growth. One of the most effective methods of overcoming this trouble is to wash the walls with 1 lb. of Shirlan W.S. in 10 gallons of hot water, and then paint the walls annually with either Shirlan A.G. in a water-casein type of paint, or in calsomines and lime washes. An alternative is Shirlan W.S. used at the rate of 1 lb. to 10 gallons of prepared water paint.

In northern Victorian districts, some passion fruit will be harvested toward the end of the month, and because of the hot, dry conditions, usually prevalent in January, the fruit should be harvested early in the morning, and immediately protected from heat and wind. A covering of wet sacks while in the packing shed will reduce the amount of shrivelling which normally occurs before it reaches the consumer. Dipping freshly picked fruit in a wax emulsion is also a very good method to prevent shrivelling. Free charts for packing passion fruit in four different kinds of cases are available on application to the Department of Agriculture. Growers should remember that an attractive pack aids selling and ensures highest prices.

Orchardists desirous of re-working peaches, apricots, cherries, plums, and almonds may bud these trees during January, provided suitable wood is available on the trees to be re-worked. If not, grafting in the spring may be used.

Citrus growers should watch closely for the development of Red Scale infestation. This insect pest develops very quickly during the hot summer months, and trees which in the early part of the season have very little infection may be very seriously infested toward the end of the season. Growers have the choice of either fumigation with cyanide, or white oil spraying. Liquid cyanide may be used, or some form of calcium cyanide dust. It is likely that this season, more liquid cyanide will be used for the control of Red Scale, because of the difficulty of obtaining other forms of cyanide. If white oil sprays are employed, the correct concentration and a generous application to the trees in a thorough manner are essential if good results are to be obtained. The treatment also of host plants in close proximity to citrus groves is necessary. These plants are a constant source of infection to the trees, and very frequently nullify the grower's efforts at commercial control.

With the high cost of fertilizers, the orchardist must carefully reconsider his fertilizer programme. In this issue of the *Journal of Agriculture* appears a list of registered fertilizers, their composition and a method of calculating their value. The choice of these fertilizers and the working out of a suitable fertilizer programme based on the prices of each of the important ingredients should be undertaken by the grower.

On the light soil types where difficulty is experienced in establishing cover crops or where weed growth is poor, consideration should be given to nitrogenous manure of the dried blood or blood manure types. In purchasing these manures, it is very necessary to work out the unit value in order to make sure that the price asked for the manure is not in excess of its commercial value.

Garden Notes

By A. W. Jessep, M.Agr.Sc., B.Sc., Dip. Ed., Principal, School of Horticulture, Burnley.

IN January work in the garden consists chiefly of maintenance. Summer annuals are beginning to flower, and the faded flowers should be picked to enable the plants to continue flowering for a longer period.

Dahlias have commenced to grow, and they should be tied to the stakes and disbudded as required. Iceland poppy, pansy, viola, calendula, and winter flowering sweet pea seed may now be planted.

For a good summer display, the perennial herbaceous plants are very effective. These plants die down naturally in the winter, and go into growth again in the early spring, and some will continue to flower until cut back by frosts. The old growths should be cut off, and if necessary the plants may be lifted. They should then be divided up and replanted as required, care being taken to remove any unsound portions beforehand. The plants vary in height from a few inches to some feet, and the flowers, from small to large, are of almost every colour. Blue usually is a popular colour in perennial herbaceous plants, and some of the most attractive varieties include the following:—

Delphiniums are old favorites, and some of the newer types are very beautiful. They require a rich moist soil and a good open position. If they show any signs of mildew, give a thorough weekly dusting with flowers of sulphur for two or three weeks. They are fond of lime, and it should be used freely during the early spring growth. At the same time, it helps to keep down attacks of slugs. Plants should be staked to prevent damage by the wind. They may be obtained from seed by either sowing in the spring and transplanting as soon as large enough to handle conveniently, or sown in the autumn and transplanted in the beginning of the spring. They should be lifted at least every second year. All old portions should be removed, leaving the healthy crown for replanting. If the crown is inclined to rot make cuttings, using the new growth and a heel of the old crown. A good strike may be obtained in this way.

Delphiniums may be had in colours ranging from reddish purple to blue. The following blue colours are very good:—

Belladonna has large single Cambridge blue flowers with comparatively small spikes, is very decorative, but is not very long lived.

Blue Bird is a darker blue of the larger type.

Elsa, Mrs. Paul Neeke, Mrs. Thompson, Orion, Queen Mary, and Wintonia are all good blues.

Campanula is an old variety of flower which is again becoming popular. It requires much the same cultivation as the delphinium. The best blue is probably *C. persicifolia Kingfisher,* which grows to a height of about 2 feet, blooms for a long time, and has large rich blue flowers.

Cynoglossum, known also as the large Forget-Me-Not, grows to a height of from 2 to 3 feet, and produces masses of large Forget-Me-Not blue flowers.

Anchusa is a strong grower, somewhat like *Cynoglossum,* but more vigorous. The flowers are of an intense blue colour, and the varieties Morning Glory and Dropmore are among the very best.

Veronica spicata grows to a height of about 18 inches, and has spikes of intense blue flowers.

Salvia patens has a perennial root stock, and requires a sheltered position. It produces flowers of a rich sky blue colour, but unless sheltered, the flowers fade very quickly. It does well in the higher altitudes.

Other perennials well worth growing include:—Aubretia, Rosemary, Lobelia, Catmint, Echinops, Lupins, Ageratum, Statice, Pentstemon heterophyllus. These blue flowering plants harmonize with most other colours, and if they are given a prominent position in the herbaceous border, the result is very satisfying.

Vegetables.

The summer vegetables should be kept well hoed to prevent the growth of weeds and to minimize the loss of moisture. Such plants as lettuce require liberal watering, and if a good water supply is available the growing of lettuce in the summer is not difficult. The fruiting types of vegetables, such as tomatoes, beans, and cucumbers, should be kept well picked to prevent the plants dying off quickly.

Watering should be thorough, and not limited merely to a daily sprinkling. As soon after watering as convenient, the area should be well hoed and mulched with stable manure. This helps to retain the water as well as to keep the soil at a more even temperature.

A final sowing of cucumbers and French beans may be made, and the ground prepared for sowing such winter vegetables as carrots, beet, turnip, cabbage, cauliflower, and swedes.

Swede turnip seed should be sown in the summer or not later than March. This gives the plants a good start before the cold weather. Once they are well established, they grow on through the winter, and will be ready for use from August to October, according to the time of sowing of seed. Sow the seed in rows about 1 foot apart, and cover to a depth of half an inch. If horse cultivation is used, the distance between the rows will vary according to the type of the cultivator, and the rows then may be 24 inches or even further apart. When the seedlings are well above the ground, thin out from about 6 to 8 inches apart. Swedes do best in a light soil that has been heavily manured for a previous crop, such as cabbage or beans. When preparing the area, a liberal dressing of superphosphate should be given and worked well into the soil.

The most popular variety of swede is "Champion Purple Top." It is a large globe-shaped type, and one that is grown by most market gardeners. It is a good grower, develops to a nice size, and has a very satisfactory flavour. "Monarch" is a larger variety, not so round in shape, and a good grower. It has not such a good flavour as "Champion Purple Top," however.

Rearing the Motherless Foal

It sometimes happens that a foal is left an orphan at an early age, and the owner is at loss to know how to feed it.

Mare's milk differs from cow's milk in that mare's milk has less protein and less fat but more sugar, therefore water and sugar must be added to cow's milk to make it suitable for the foal. To 20 ounces of cow's milk, add 5 ounces of boiled water and one desertspoonful of sugar. The foal should be fed five times daily and the quantity gradually increased until it is taking 7 to 8 quarts a day. One cup of linseed gruel, made by simmering whole linseed in a little water, may be added two or three times a week.

Induce the foal to eat crushed oats by placing a small quantity in a convenient place. The animal should be protected from all cold and wet weather, and given hygienic surroundings. If constipation occurs at any time give 2 to 3 tablespoonfuls of castor oil according to the size of the foal.

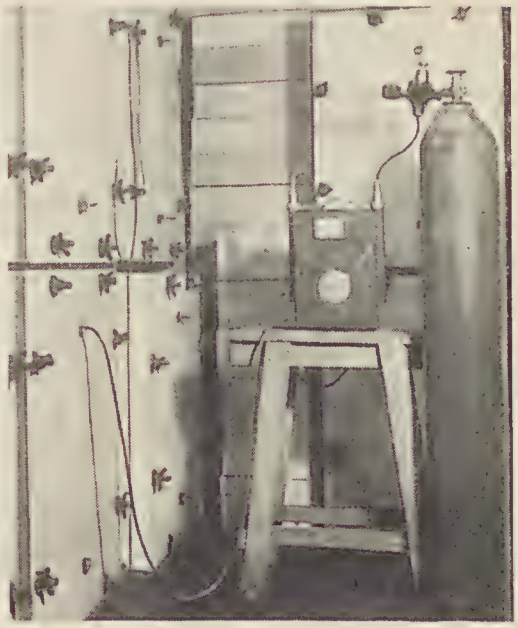
Gas Storage of Peaches

By F. E. Huelin, B.Sc.,Ph.D.,* and G. B. Tindale, B.Agr.Sc.†

THE results described in this article have been obtained from five years' work (from 1936 to 1940) on the gas storage of peaches. The experiments were initiated under the Advisory Committee on Fruit Storage Investigations. Dessert peaches are grown mainly in the Doncaster district, near Melbourne. They are sold chiefly in the local market, and cool storage has had little application in this industry, as there is a succession of varieties which mature from early December to the end of March. In the storage work on peaches the authors have had in mind the possibilities of export to England, where a profitable market might be exploited if the peaches could be landed there in good condition.

As described in previous papers (1, 2), peaches do not ripen at 32 deg. and can be stored at this temperature for only a limited period if they are subsequently to ripen well at higher temperatures. The storage life of peaches at 32 deg. is the maximum period they can be stored at this temperature and still ripen satisfactorily at higher temperatures. If stored beyond this period, they fail to ripen satisfactorily, and develop mealiness and discoloration of the flesh.

In the earlier work on peaches, results of which were published in 1937 (1), the peaches were generally picked quite hard, with a firmness of 16-20 lb.‡ and rather green. They were stored at 32 deg. and ripened at 65 deg. The peaches picked when the ground colour was deep green and with only a trace of blush were quite useless. They kept well at 32 deg., but did not develop any quality on ripening. However, if the peaches were picked a little more forward (pale green and with more blush developed), they ripened with quite fair quality, but in many cases had a storage life of only five weeks, which is insufficient for export. Moreover, it was found that they would not ripen at 45 deg., which approximates to the prevailing temperatures when the peaches would arrive in England. Hence the peaches would have to be conditioned at 65 deg. before marketing.



Gas-tight cabinets used for gas storage. Nitrogen is being introduced from the cylinder into one of the cabinets through a gas meter.

The work on gas storage was initiated in an attempt to prolong the storage life. The peaches have been stored in gas-tight containers in various atmospheres, in which the carbon dioxide content was greater and the oxygen content was less than that of ordinary air. Atmospheres such as those containing (*a*) 5 per cent. of carbon dioxide and 16 per cent. of oxygen or (*b*) 10 per cent. of carbon dioxide and 11 per cent. of oxygen were obtained simply by controlled ventilation, as the effect of respiration of the fruit is to increase the carbon dioxide and reduce the oxygen by approximately equal amounts. Air contains 21 per cent. of oxygen and only a trace of carbon dioxide. To obtain atmospheres containing (*c*) 5 per cent. carbon dioxide and 10 per cent. oxygen, (*d*) 5 per cent. carbon dioxide and 5 per cent. oxygen, or (*e*) 10 per cent. carbon dioxide and 5 per cent. oxygen, it was necessary to introduce

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† Cold Storage Research Officer of the Victorian Department of Agriculture.
‡ Determined with a U.S. penetrometer fitted with a plunger $\frac{1}{16}$" in diameter.

nitrogen into the container and also ventilate with air. Most of the experiments have been carried out with atmospheres such as (*a*) and (*b*), which are obtainable by controlled ventilation with fresh air.

Gas storage results obtained up to 1937 (1) were published in the *Victorian Journal of Agriculture* for December of that year. In all this earlier work the peaches were ripened at 65 deg., and the storage life at 32 deg. was consistently greater in gas storage than it was in air storage. On the average the increase obtained was about 50 per cent. It was found that the maximum increase could be obtained by the simplest method of gas storage, i.e., controlled ventilation, using atmospheres containing 8–10 per cent. of carbon dioxide and 13–11 per cent. of oxygen. Reducing the oxygen content down to 5 per cent. did not result in any further increase in the storage life.

Influence of Maturity on Gas Storage.

During the last three years (1938-40) the peaches have generally been obtained in a more forward condition. They have ripened with much better quality, and the storage life of the softer peaches in air at 32 deg. has not been significantly less than that of the firmer peaches. Gas storage, however, has failed to increase the storage life of the softer peaches (with a firmness of 10 lb. or less). In many cases gas storage has actually decreased the storage life of the softer peaches. A previously unsuspected relation between the response to gas storage and the degree of firmness at picking has become apparent.

In Table 1 the results of the last five years' work (1936-40) on gas storage are summarized. The peaches were generally ripened at 65 deg., except in 1939, when they were ripened at 60 deg. The storage life at 32 deg. in air is compared with the storage life in the

TABLE 1.—GAS STORAGE OF PEACHES AT 32° DURING 1936-40. RIPENED AT 60-65°.

Variety.	Date of Picking.	Ground Colour.*	Firmness (lb.).†	Quality after Ripening.	Storage Life at 32° (Weeks).		
					In Air.	In 8–10 % CO_2, 13–11 % O_2.	Difference.
Zerbe	13.1.36	3½	18	fair	7	8	+ 1
	9.1 39	2½	17	excellent	7	9	+ 2
	10.1 38	fully blushed	8	,,	6	6	0
Smith's	21.1.36	2	20	fair	6	9	+ 3
	5.2.40	2	16	excellent	3	4	+ 1
	25.1.38	3½	10	,,	9	6	− 3
	25.1.39	2	9	,,	6	6	0
	9.2.40	2	8	,,	4	6	+ 2
	25.1.39	3½	3	,,	6	1	− 5
Millicent	5.2.36	2	17	good	7	9	+ 2
	17.2.40	2	14	very good	5	6	+ 1
Catherine Anne	10.2.37	2½	17	good	7	13	+ 6
	3.2.39	2	15	excellent	4	7	+ 3
	14.2.40	2½	15	,,	6	9	+ 3
	17.2.40	3	13	,,	7	9	+ 2
	3.2.39	2½	7	,,	5	7	+ 2
	1.2.38	3	7	,,	8	8	0
Late Crawford	15.2.37	3½	17	good	6	11	+ 5
	7.2.36	3	17	,,	9	13	+ 4
	21.2.40	2½	16	excellent	6	8	+ 2
	26.2.40	3½	15	,,	4	5	+ 1
	10.2.39	3½	12	,,	5	5	0
	10.2.38	3½	12	,,	9	7	− 2
	10.2.39	4½	3	,,	6	4	− 2

* 1, deep green; 2, pale green; 3, green-yellow; 4, pale yellow. The corresponding plates in Maerz and Paul's "Dictionary of Colour" are 21L5, 21L3, 21L1-2, 13L1-2.

† Determined with a U.S. penetrometer fitted with a plunger 5/16" in diameter.

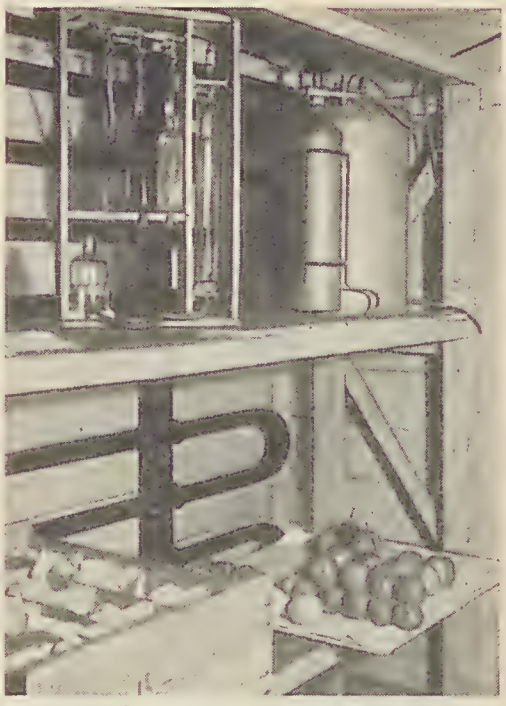
atmosphere containing 8–10 per cent. of carbon dioxide and 13–11 per cent. of oxygen, which has given the optimum results with firmer peaches. In 1939 and 1940 the experiments were carried out with peaches in two stages of ripeness. The very immature peaches, which developed no quality at all on ripening, are not included in Table 1. In each variety the samples are arranged, not according to year, but in order of decreasing firmness. The firmness was determined with a U.S. penetrometer, fitted with a plunger 5/16 inch in diameter. The colour varied little with maturity.

The advantage (or otherwise) of gas storage is shown in the last column, which gives the difference between the storage life in air and the life in gas storage. When the difference is positive, the life is increased by gas storage. A negative difference indicates that the life has been decreased by gas storage.

When we examine each variety in turn, the increase in life as a result of gas storage is practically in the same order as the firmness at picking. In most varieties gas storage gave a consistent increase only when the firmness was 15 lb. or more at picking. In the Catherine Anne variety, however, gas storage has increased the life of peaches which had softened down to about 10 lb. before picking. The best results were obtained when the firmness was 17–20 lb., but such peaches did not develop the maximum quality on ripening. In the Smith's and Late Crawford varieties gas storage actually decreased the life of the softer peaches with a firmness of 10 lb. or less.

The Catherine Anne is the only variety which has given really outstanding results. With the very firm but barely mature peaches, an increase in the storage life of six weeks has been obtained. In the more mature but still firm peaches the increase has been 2–3 weeks. Even in the softer peaches no decrease in the storage life has been obtained.

The difficulty of using gas storage to increase the storage life is that it would have to be confined to the very firm peaches, which may not always ripen with maximum quality. Moreover, the picking of peaches to any precise degree of maturity is practically impossible in very hot weather, when their firmness may drop over 10 lb. in 24 hours. A difficulty in regard to gas storage for overseas shipment is that the firmer peaches, which respond best to gas storage, generally fail to ripen at 45 deg., and would need preliminary conditioning at 65 deg. after discharge in England.



Ripening chamber with peaches in trays on bottom shelf and Orsart apparatus for gas analysis on top shelf.

Effect of the Storage Atmosphere.

Experiments in 1939 and 1940 have confirmed earlier conclusions that the maximum increase in storage life is obtained by using atmospheres containing 8–10 per cent. of carbon dioxide and 13–11 per cent. of oxygen (by controlled ventilation) at 32 deg. In 1940 three varieties (Smith's, Catherine Anne, and Late Crawford) at two stages of maturity were stored in five atmospheres—(*a*) 5 per cent. CO_2, 16 per cent. O_2; (*b*) 10 per cent. CO_2, 11 per cent. O_2; (*c*) 5 per cent CO_2, 10 per cent. O_2; (*d*) 5 per cent. CO_2, 5 per cent. O_2; and (*e*) 10 per cent. CO_2, 5 per cent. O_2. With one exception, the storage life was the same in all five atmospheres. But in the less mature Late Crawford peaches the storage life in atmospheres (*a*), (*c*), and (*d*), containing 5 per cent. of carbon dioxide, was the same as in air, while the storage life in atmospheres (*b*) and (*e*), containing 10 per cent. of carbon dioxide, was two weeks longer. This supports the previous conclusion (1) that the increase in the storage life of peaches is due primarily to the carbon dioxide content of the atmosphere irrespective of the oxygen content.

Gas Storage followed by Storage in Air at 32 Deg.

In experiments with pears, the authors concluded that the effect of gas storage in retarding the senescence of the fruit was exerted particularly during the early stages of storage. Towards the end of the storage life the pears tended to become more susceptible to injury by carbon dioxide. It was thought possible that the gas storage of peaches might give better results if it were limited to about a month at the beginning of storage, and the peaches were then transferred to air. In 1939 five varieties were stored at 32 deg. in 5 per cent. CO_2, 16 per cent. O_2, and 10 per cent. CO_2, 11 per cent. O_2 (by reduced ventilation). The atmospheres were maintained continuously and also for initial periods of four and six weeks before the peaches were transferred to air. Samples were removed at weekly intervals and ripened at 60 deg. for determination of storage life. The results are set out in Table 2.

Gas storage for six weeks gave practically the same results as continuous gas storage with the Catherine Anne variety. Gas storage for only four weeks gave the same results as continuous gas storage. With the Zerbe variety gas storage for only four weeks gave a storage life one week less than that obtained in continuous gas storage. In the Smith's and Late Crawford varieties, which are more easily injured by carbon dioxide, gas storage for only four weeks gave a better result than continuous gas storage. In the less mature Smith's peaches gas storage for only four weeks gave the maximum storage life of eight weeks (two weeks longer than the life in air). In the more mature Late Crawford peaches, where continuous gas storage actually reduced the storage life, the reduction was eliminated by gas storing for only four weeks.

Caution is necessary in drawing conclusions from these few results, but it is very probable that gas storage for the first month would give almost the maximum increase of life in the firmer peaches, and would considerably minimize any injurious effects in the softer peaches.

Effect of Temperature during Gas Storage.

Experiments on gas storage have been mainly confined to the two temperatures 32 deg. and 34 deg., and the comparison of results obtained at these two temperatures is given in an earlier publication (1). Generally, when the storage life was increased by gas storage at 32 deg., it was also increased at 34 deg., but the storage life was less at 34 deg. than at 32 deg. both in air and gas storage.

In 1938 Catherine Anne peaches were stored at 45 deg. and 55 deg. in air, 5 per cent. CO_2, 16 per cent. O_2, and 10 per cent. CO_2, 11 per cent. O_2 (by reduced ventilation). The peaches ripened at both temperatures, and gas storage did not retard ripening appreciably. The peaches ripened with excellent quality both in

TABLE 2.—GAS STORAGE OF PEACHES, 1939.

Variety.	Maturity.	Firmness (lb.).	Storage Life at 32°, when Ripened at 60° (Weeks).							Storage Life at 32°, when Ripened at 45° (Weeks).		
			Air.	5 % CO_2, 16 % O_2.	10 % CO_2, 11 % O_2.	5 % CO_2, 16 % O_2 4 weeks then air.	10 % CO_2, 11 % O_2 4 weeks then air.	5 % CO_2, 16 % O_2 6 weeks then air.	10 % CO_2, 11 % O_2 6 weeks then air.	Air.	5 % CO_2, 16 % O_2.	10 % CO_2, 11 % O_2.
Wiggin	..	4	2	2	2	..	..	..	..	Failed to ripen.		
Zerbe	..	17	7	9	9	8	8	9	9	3	3	3
Smith's	1st	9	6	7	6	7	8	7	6	Failed to ripen.		
	2nd	3	6	3	1	..	..	..	..	3	2	1
Catherine Anne ..	1st	15	4	7	7	7	7	7	7	Failed to ripen.		
	2nd	7	5	7	7	7	7	8	7	3	3	3
Late Crawford ..	1st	12	5	5	5	5	5	..	..	Failed to ripen.		
	2nd	3	6	5	4	6	6	..	..	4	3	1

air and in 5 per cent. CO_2, 16 per cent. O_2. In 10 per cent. CO_2, 11 per cent. O_2, a definite "off" flavour developed during ripening.

Effect of Temperature during Ripening.

In the results discussed previously, ripening after gas storage has always been carried out at 60 to 65 deg. In 1939 the air and gas stored peaches were also removed to 45 deg. for subsequent ripening. The results are set out in Table 2.

From these results, it is apparent that gas storage should not be used under any circumstances where the subsequent ripening temperature is as low as 45 deg. The less mature peaches, in which gas storage has given the best results when subsequently followed by ripening at 60 to 65 deg., generally failed to ripen at 45 deg. The more mature peaches, which ripen better at 45 deg., are those most subject to injury by gas storage.

For this reason (in addition to the difficulty of obtaining peaches at an exact stage of maturity) gas storage is not recommended on shipboard, should the export of peaches to England be contemplated. Apart from the storage life, the problem of subsequent ripening at English temperatures, which approximate to 45 deg. in March, is a major difficulty in export. Preliminary treatments are at present under investigation to enable peaches to ripen subsequently at 45 deg., and these have given promising results. As the effect of such treatments, however, is to bring the fruit to a much more advanced stage of ripeness, they could not be used in conjunction with gas storage.

Summary.

The storage life of peaches in air at 32 deg. is little affected by picking maturity, but shows a considerable seasonal variation.

On the other hand, the effect of gas storage is closely related to maturity. Peaches picked in a firm condition (15 lb. or more) generally have their life at 32 deg. increased by gas storage. The storage life of softer peaches 10 lb. pressure or less) is unaffected or decreased by gas storage.

Where the life is increased by gas storage, the maximum effect is obtained in atmospheres containing 8–10 per cent. of carbon dioxide and 13–11 per cent. of oxygen (by reduced ventilation).

Increases in the storage life as a result of gas storage have been obtained only when the peaches have been subsequently ripened at 60–65 deg. Any advantage of gas storage is lost if the peaches are subsequently ripened at 45 deg.

References.

(1) Huelin, F. E., Trout, S. A., and Tindale, G. B., *J. Agr. Vic.*, 1937, 35, 609.

(2) Tindale, G. B., Trout, S. A., and Huelin, F. E., *J. Agr. Vic.*, 1938, 36, 609.

CHICK SEXING—*continued from page 30.*

tests have broken down. It certainly would be a great help to the poultry-keeper to be able to control the sex. With eggs as the chief object on farms where White Leghorns are kept, the females are the birds required. Some poultry-keepers top off their cockerels at various ages, and generally receive good prices, but many consider that the work is hardly worth while, and dispose of them as soon as possible.

It is the opinion of many poultry-keepers that the proportions of sexes in poultry are nearly equal. The sex ratio is influenced by many factors. It is well known that sometimes there is an excess of males, and at other times females. Pearl (1917) recorded the sexes of 20,037 chickens, produced from families of ten and over, and found the proportions to be 944 males to 1,000 females.

Complete List of Qualified Chick Sexers.

A list of holders of chick sexing certificates issued by the Department of Agriculture since the commencement of the examinations, in 1938, is shown hereunder:—

SPECIAL CERTIFICATE.

H. A. Jenkin, 18 Corio-street, Belmont, Geelong.

K. C. McLister, 176 Hall-street, Spotswood, W.14.

FIRST CLASS CERTIFICATE.

C. Bode, Research P.O.

E. J. Marchant, 33 Potter-street, Black Rock, S.9.

W. J. Millington, "Fenton," Murray-street, Fawkner, N.15.

T. H. Pettigrove, 159 Hawdon-street, Heidelberg, N.22.

The "Rabbito" Defect in Butter

Methods of Control

By A. G. F. Itzerott, B.Agr.Sc., Assistant Dairy Technologist

ISOLATED outbreaks of the "rabbito" defect in Victorian butter during the warmer months of the past three or four years have resulted in considerable economic losses to the factories concerned. The purpose of this article is to present in a concise form known facts relating to the problem, which has become a serious menace to the butter industry.

The development of the defect in butter (and also cream) is due to bacterial activity in the protein or serum fraction, which under favorable conditions gives rise to a repulsive putrid aroma, combined with a meaty taint. The author has found it quite easy to reproduce the defect in experimental churnings, by inoculating into the butter, organisms that had been isolated from commercial butters exhibiting the trouble.

Several stages in the development of the defect have been recognized. Usually, though not always, the putrid aroma is preceded by what has been termed the "condensed stage," in which there is an aroma resembling that of condensed milk. This stage is now generally recognized as being the precursor of the "rabbito" defect, and butters exhibiting such are graded accordingly. The transition from the "condensed" to the putrid stage is usually rather rapid, and frequently the butter becomes putrid without the "condensed" stage being observed.

The bacterial counts of "rabbito" butter are invariably high, and usually the gelatine plates are so badly liquefied as to render counting of the colonies impossible. The liquefaction of gelatine is due to the strong proteolytic power of the "rabbito" organisms.

A study of the counts as the defect develops in a box of butter has shown that the greatest development of organisms in the early stage is at or near the surface of the butter. This suggests that the defect develops primarily at the surface and is in the form of a surface taint, while subsequently it penetrates throughout the butter mass. The rate of development through the butter appears to be influenced by its texture. Experiments and observations have shown that the defect occurs most frequently and develops most readily in butters exhibiting free moisture and air pockets due to bad packing.

Factors affecting development of the defect in butter once contamination has taken place are temperature, acidity, salt and physical structure.

Temperature.

Temperature is definitely the greatest factor influencing the development of the "rabbito" defect. Work has indicated that with temperatures between 60 and 90°F. the defect will develop within two to four days, while on the other hand, temperatures below 55°F. have a definite retarding effect.

During the summer months when temperatures rise, the presence of "rabbito" organisms in butter may result in the development of the defect in a few days, particularly in retail stores where the butter may not be stored in an effective cold chamber. However, even with high temperatures, a high butter acidity or heavy salt content may retard the development of the defect, as will be shown later.

During the winter months, low temperatures coupled with the presence of salt would usually be sufficient to prevent the development of the defect, even if the butter was heavily contaminated with "rabbito" organisms. This is borne out by practical observations, for it has been noticed that the defect occurs during the warm period of the year extending from September to March.

In studying the effects of cold storage (12 to 15°F.) on the development of the defect, it was found that butters given a heavy inoculation of "rabbito" organisms and placed in cold storage for a period of three months, showed no signs of the defect on removal from storage. However, after thawing out, the inoculated butters rapidly developed the defect when exposed to temperatures between 65 and 95°F. The taint was usually well developed in 30 to 40 hours.

Butters contaminated with "rabbito" organisms have frequently escaped the notice of the graders (probably due to the fact that the butter has not been subjected to conditions favorable to the development of any stages of the defect prior to grading) only to develop the defect on arrival in England after removal from cold storage and thawing out. The defect will not develop during cold storage even in unsalted butter. The low temperatures prevailing during cold storage do not destroy the organisms but merely inactivate them for the duration of the storage period.

Acidity.

Investigational work has indicated that cream acidities ranging from 0.06 to 0.15 per cent. lactic acid have little effect on the time taken for the defect to develop in the butter made from such cream, contamination being constant. Beyond 0.15 per cent. lactic acid however, acidity appears to have a retarding effect. High acidities in conjunction with low temperatures will definitely inhibit the defect. Unsalted butter made from cream with an acidity of 0.2 per cent. lactic acid, and inoculated with "rabitto" organisms showed no sign of the defect when held at temperatures between 40 and 55°F. for a period of three weeks—however at higher temperatures (80-90°F.) the taint developed despite the high acidity.

Since the bulk of Australian butter is made from cream with an acidity below 0.15 per cent. lactic acid, it would appear that acidity exercises little control on its own, though in conjunction with salt it may be important.

Salt.

The effect of salt on the development of the defect was studied in conjunction with acidity. Results showed that in butter made from cream with an acidity between 0.05 and 0.15 per cent. lactic acid, salt concentrations up to 1.4 per cent., though slowing up the development of the defect, did not prevent its appearance if favorable temperatures existed. A salt concentration of 1.7 per cent. or over does definitely check development, and from work done it can be said that a salt concentration of 1.7 per cent. in butter made from cream with an acidity between 0.06 and 0.15 per cent., will give a reasonable amount of protection against the development of the defect. The experiments seemed to indicate that salt had a greater effect than acidity in checking the growth of the organisms.

Provided the storage temperatures are kept down and disposal through retail channels on removal from storage is not delayed, chemical control of the defect is possible. However chemical control along these lines (i.e. high acid and high salt) is not desirable. High acidities result in texture defects in cream which cause trouble during and subsequent to pasteurization, and furthermore high acidity and salt concentrations in butter invariably lead to other undesirable chemical changes during storage, e.g., tallowiness and fishiness.

Physical Structure of the Butter.

The structure of butter has been proved to be of vital importance in bacterial multiplication. Observations during the investigations, and also comments by graders, indicate that the "rabbito" defect occurs most frequently and develops most rapidly in butters showing an open texture and free moisture. Bad packing, with the presence of air pockets in the butter, also serves to encourage the defect.

Factory Surveys and Laboratory Control.

Comprehensive bacteriological surveys of a number of factories that have produced "rabbito" butter intermittently throughout the summer months of the last two or three years have been carried out. In each case the factory had experienced trouble from the defect just prior to the visit. All surveys, with the exception of one, produced negative results. At one factory the "rabbito" defect was detected in raw cream and organisms capable of reproducing the defect in butter were subsequently isolated from such cream. In this case the subsequent development of the defect in the manufactured butter was due to incomplete destruction of organisms because of inefficient pasteurization.

The abortive results of surveys suggest and confirm the belief that the organisms gain access to the factories from outside sources (infected cream which may escape grading and pasteurization; water supplies, &c.), and set up a deep-seated focus of infection which is extremely hard to locate and furthermore to eradicate; and which may cause occasional out breaks during hot spells, or following any laxity in cleaning due to pressure of work or other causes. From this it will be seen that for a survey to yield positive results it is necessary for a technologist to be at the factory during the period in which conditions are

favorable for the organisms to multiply and come to the surface at the focus of infection. After an outbreak, the factory is usually given a thorough clean up before a technologist is called in to take samples and locate the point of infection. The clean up removes any surface contamination but leaves the deep-seated infection, which remains in a latent state until favorable conditions again exist, when there is a flaring up of bacterial activity. It is during this period that the factory operative should be on his guard.

A deep crack in a wooden churn may harbour the organisms. Although a contaminated churn would not give trouble during the winter, trouble may occur in the warmer months of the year, when temperatures rise and factory work becomes more intense. It is not likely that all churnings will be affected—only three or four bad churnings may occur intermittently throughout the whole of the summer. There is evidence on record to show that the replacement of a churn suspected of being contaminated was successful in eliminating the defect.

A close check on butters coming on to the grading floors from suspect factories, particularly during the warmer months of the year and at periods when factory equipment is overloaded with work and there is insufficient time to thoroughly cleanse it, has revealed the important fact that just prior to an outbreak of "rabbito" there is a tendency for the butter counts to rise suddenly to very high levels. This has provided the laboratory technician with a definite means of predicting an outbreak and helping to control it. As soon as the butter counts rise to dangerously high levels it is possible to issue a warning to the factory concerned and to recommend the adoption of vigorous sanitary measures. This feature of control has proved to be most valuable from the technical viewpoint and rarely fails to produce some improvement in butter quality.

It has been fairly definitely established that the source of the "rabbito" organisms is water —water that may be used on the farms for washing equipment or flushing out milking machines and separators, or in the butter factory for washing butter granules, &c. In some cases the organisms are brought to the factory in raw cream. In two cases where butter had been graded as having strawberry flavour, organisms capable of reproducing the "rabbito" taint in butter were isolated from bore water, which was being used at the factories concerned, for washing butter granules.

Control Measures.

Grading of Cream.—A rigid grading of cream, with rejection or destruction of any infected sample is essential.

Sanitation.—Since the defect is due to bacterial activity, the whole basis of control lies in factory sanitation. Although chemical control is possible up to a certain point, it is not desirable as it invariably leads to other trouble.

Pasteurization is of vital importance, and it is absolutely essential that a strict supervision be maintained during this phase of processing. The "rabbito" organisms are unstable when heated, and efficient pasteurization will destroy them.

The water used for washing butter granules is also important and should be of high bacteriological purity. Chlorination, provided there is a residual chlorine content of 1 p.p.m. in the water at the churn will give a sterile water. It is essential also, to give all equipment such as vats, pipe-lines, pumps, cooler, churns, &c., a thorough cleansing—particularly is this of importance with the equipment that comes into contact with the cream subsequent to pasteurization. The pump packing should be renewed daily.

The churns present a problem, particularly if cracks or furry surfaces are present. These, together with the glands, may serve as zones of deep-seated infections. The following method of churn cleansing can be recommended:—

Remove all butter from the churn and rinse with water (120 to 130°F.) for 5 to 10 minutes—run off.

Wash churn with a 0.1 to 0.2 per cent. soda solution at a temperature above 175°F. for 15 minutes.

Wash with water at a temperature of over 195°F. for 15 to 20 minutes.

Run off the water and then spray the inside surface of the churn with a hypochlorite solution (250 to 300 p.p.m. of available chlorine) to eliminate surface contamination. The churn should be stopped in such a position that it dries out thoroughly in the shortest time.

Before use the next day the following procedure should be adopted in preparing the churn:—

(1) Scald churn for five minutes with boiling water.

(2) Thoroughly chill the churn by rinsing with cold water. The presence of 50 p.p.m. of available chlorine in the chilling water is advantageous from a germicidal viewpoint.

In the cleansing process the churn should be ⅓ to ½ full. Use of soda assists in emulsifying the fat left in the churn and, further, it adds to the germicidal properties of the hot water. The use of high temperatures permits of rapid drying out of the churn when the rinse water is drained away. This leaves a dry surface which is unfavorable for bacterial activity. The hot water treatment opens up the pores in the wood permitting of penetration of the cleansing solutions.

Briefly, sanitary control measures may be enumerated as follows:—

(*a*) efficient pasteurization;

(*b*) thorough cleansing and sterilization of all equipment to eliminate any chances of contamination subsequent to pasteurization;

(*c*) chemical treatment of water used in the factory, particularly when the water is drawn from streams, wells, bores, &c.

Laboratory Control.—As previously mentioned, an outbreak of "rabbito" is invariably preceded by a sudden rise in butter counts, hence the routine study of butter counts at regular intervals by laboratory technicians provides a most valuable and useful aid in predicting an outbreak. When the butter counts rise to a high figure and the presence of typical gelatine liquefiers is noted, warnings can be issued, and the adoption of rigorous sanitary measures recommended to the factory concerned.

Keeping Quality Test.—This provides a most useful check on the keeping quality of the butter produced at a factory. A small sample of butter is taken from each churning and held for several days. From an examination of these samples at frequent intervals a guide can be obtained as to the rate of deterioration of the sample, and hence the sanitary conditions existing in the factory. A rapid deterioration in the keeping quality test should suggest that factory cleanliness is not all that it should be. A survey by a technologist will usually reveal any bad points of contamination.

Proper working of the butter to give a uniform and plastic texture is another remedial measure.

Live Stock Notes

(*Continued from page* 20).

difficult to reach when the birds become distressed during the very hot weather. Water vessels placed temporarily on the floors in the centre of the pens, and as near as possible to the birds, have been of great advantage in this respect.

The number of deaths that occur on each farm during a heat wave varies considerably. Many factors are involved, which influence the extent of mortality, and various means of reducing this loss to a minimum have been tried. Many poultry keepers spray the litter and the walls of the houses, and also the birds, with water at frequent intervals during the hottest part of the day with most satisfactory results.

It should be fully realized that good birds kept under healthful conditions, together with good feeding and management, are the only means of maintaining a high standard of health and natural resistance to varying weather conditions.—(H. F. Clinton, Poultry Expert.)

Bees.

Where honey is being gathered freely, extraction should be proceeded with as soon as necessary.

Where dry conditions have so reduced the pollen supply as to interfere seriously with breeding, it would be advisable to move the hives, or at least the weakest hives, to a district where pollen is more plentiful. Frequently there is a complete gap in activity following the red gum blossoming, and if the bees are not moved to a more favoured location they become so depleted in strength that they may not be able to gather sufficient autumn honey. The amount of brood raised in late January and February directly influences the quantity of honey stored during March and April; therefore, where the autumn prospects are good, the bees should be kept at full strength. When feed is scarce it is advisable to have the apiary broken up into small units scattered over as large an area as possible. —(J. S. Eagland and J. W. Thomlinson.

PASTURE INVESTIGATIONS—*continued from page 16.*

conspicuous, for this grass has become very rank and tussocky, being almost entirely neglected by the stock, in contrast to its apparent palatability during the first two years. Timothy, meadow, foxtail, Kentucky blue grass, and strawberry clover are very sparse. The development of the red clover is a feature of the plots. This species appears to be well suited to the local conditions, and has contributed largely to the production of the pasture. The fact that it sets seed fairly freely at Swan Hill may partially account for its persistence in the sward.

On the manurial plots the first year of mowing revealed a good response to liberal dressings of superphosphate. So far, 3 cwt. of super. per acre has proved the optimum dressing on this irrigated pasture. It shows a big increase in production over "super. 2," but the yield is not further significantly increased by additional super. However, the results from one year of mowing must be viewed with reserve; conclusions that a dressing of 1 cwt. of super. is worthless, or that the limit of profitable application has been reached at 3 cwt. will have to be confirmed in subsequent years. The results in the 1939-40 season have shown an appreciable increase from super. 1 cwt. compared with no manure, and progressive increases up to 6 cwt. of super. Of the manures and soil amendments used in combination with 2 cwt. of superphosphate, only lime has shown any benefit, a significant increase being obtained by the addition of 10 cwt. of lime, but this is equalled by the use of an extra cwt. of super.

Stanhope (E. Hadfield).

Four bays of a well-manured pasture at Stanhope were fenced off in June, 1938, and eight randomized blocks of twelve manurial treatments were laid down. Four of these blocks have been mowed and four grazed since that date. Of the plots considered in this report, those at Stanhope were the only ones to suffer from severe restrictions in water supply during the 1938-39 season. The irrigation season opened on the 24th September, 1938, and terminated on the 30th January, 1939, and during that period it was possible to water the plots only six times. This meant an average interval of nearly a month between waterings for a season during which the total rainfall was only 42 points.

A typical pasture of irrigation white clover in the Rochester district.

On the mowing section, the residual effect of the superphosphate, which, for the previous six years, had been regularly applied over the whole area, would be expected to upset the early results from differential manuring, and, indeed, the figures for the first year are somewhat confusing. As at Swan Hill, super. 3 cwt. appears to be the optimum dressing, and the limit of profitable application. This dressing and super. 6 cwt. are the only two treatments which have given a significant increase over "no manure." The increase obtained over super. 2 cwt. by the addition of 1 cwt. of ammonium sulphate, while no greater than that obtained from an extra cwt. of superphosphate, seems very definite. The addition of lime to the combination depresses the yield. With the several anomalies arising from the results, it would appear that this test will have to continue for some time before definite conclusions can be drawn.

Cohuna (G. Major).

The plots on the property of Mr. G. Major at Cohuna were sown on fallow in 1933, and have developed into a well-balanced pasture whose high production can be gauged from the fact that on the grazing section a carrying capacity of 1.2 cattle and 4.5 sheep per acre per annum was recorded for the twelve months ending 31st May, 1939. During the 1938-39 irrigation season the plots received twelve waterings at an average interval of a fortnight—except for the period from 10th February to 3rd April, during which 4 inches of rain were recorded. The total rainfall for 1938 was only 6 inches.

On the species section adjoining the manurial plots, all the sown species—with the exception of meadow foxtail—made a good start, but within two years perennial rye-grass and white clover were dominating the sward, although cocksfoot and *Phalaris tuberosa* were still prominent where sown. Now, white clover and perennial rye-grass have taken command over the whole area, with cocksfoot and strawberry clover still prominent on their plots and well represented in the manurial section which was sown with a complete mixture.

Only a few plants of alsike, red and subterranean clovers remain, and timothy and meadow foxtail have practically disappeared. *Phalaris tuberosa* and Kentucky blue grass are still in evidence on their respective strips.

The layout of the manurial trial does not lend itself to a statistical analysis of the results, but differences referred to are sufficiently well defined to be considered reliable. Super. 2 cwt. showed a considerable increase over no manure, but this increase was more than trebled by doubling the quantity of superphosphate. The addition of lime, gypsum or potash to 2 cwt. of super. did not appreciably affect the yield, and bone fertilizer was definitely inferior to super. The big decrease in production resulting from dividing the annual quota of 4 cwt. of superphosphate into two 2-cwt. dressings is contrary to results obtained elsewhere, particularly at Werribee, where a test conducted on a similar type of pasture, over a period of years, showed that plots receiving an annual dressing of 4 cwt. of super. per acre showed no difference in yield whether this was applied all at once or given as two, three, or four applications during the year.

Tongala (J. Bullingham).

The Tongala plots closely resemble those at Cohuna; both were sown in 1933 on the sites of former lucerne trials. They have the same layout, and both have developed into a first class pasture of a well-balanced mixture of perennial rye-grass, white clover, and cocksfoot. Nineteen waterings were applied during the 1938-39 season.

The results here for the first year differed somewhat from those at Cohuna. Lime, in addition to 2 cwt. of super., gave a response

White clover and volunteer Italian rye grass on Mr. J. Bullingham's Tongala property.

which, however, was not as great as that obtained with an extra 2 cwt. of super. Bone fertilizer compared favourably with superphosphate as regards yield, but the comparison is not so favorable from the economic standpoint. As was the case at Cohuna, the highest yield was obtained from the plots receiving 4 cwt. of superphosphate per acre, but unlike Cohuna, an apparent increase was derived from splitting the dressing into two applications.

RESULTS OF MANURIAL TRIALS ON IRRIGATED PASTURE PLOTS — SWAN HILL, COHUNA, TONGALA, AND STANHOPE.

Average of Results for Two Seasons (1938-39 and 1939-40).

Manurial Treatment per Acre per Annum.	Cwt. Dry Matter per Acre.			
	Swan Hill.	Stanhope.	Cohuna.	Tongala.
No manure	54·1	60·8	77·4	56·9
Super. 1 cwt.	57·3	64·1	80·9	61·0
Super. 2 cwt.	63·2	62·2	89·9	67·3
Super. 3 cwt.	76·9	78·5	..	..
Super. 4 cwt.	89·7	75·9	105·0	80·8
Super. 4 cwt. (2 applications)	..	..	92·2	81·6
Super. 6 cwt.	80·1	79·2	..	..
Super. 2 cwt. + amm. sulph. 1 cwt.	62·8	71·4	..	..
Super. 2 cwt. + pot. sulph. 1 cwt.	67·1	67·8	86·8	67·8
Super. 2 cwt. + amm. sulph. 1 cwt. + pot. sulph. 1 cwt.	63·3	68·1	..	..
Super. 2 cwt. per annum + lime 1 ton every 5 years	..	..	87·1	70·3
Super. 2 cwt. per annum + gypsum 1 ton every 5 years	..	..	88·5	74·6
Super. 2 cwt. + lime 10 cwt.	78·5	63·4	..	..
Super. 2 cwt. + gypsum 10 cwt.	64·8	69·8	..	..
Super. 2 cwt. + amm. sulph. 1 cwt. + lime 10 cwt.	68·3	61·3	..	..
Bone fertilizer 2 cwt.	..	..	85·5	67·8

In the tests at Swan Hill and Stanhope, where the plots are replicated four times in randomized blocks, differences of 14 per cent. were found to be necessary for significance. At Tongala the plots are replicated only three times, and are not randomized, consequently too much reliance must not be placed on the 5 per cent. difference between the two super. 4-cwt. treatments. Applying the annual quota of superphosphate all at once has the advantage of minimizing the cost of application of the manure.

INVESTIGATIONS ON SALT-AFFECTED LAND, KERANG.

Progress Report.

Irrigated pasture culture has been an effective means of reclaiming salt-affected land in parts of northern Victoria. In order to investigate and demonstrate the most effective methods of pasture establishment and maintenance on such lands, pasture experimental work has been undertaken in the Kerang district, and an officer of the Department of Agriculture has been stationed at Kerang in order to supervise this work.

Three test blocks, each 10 acres in area, have now been established in the Kerang district. Each block serves land of a particular soil type, and the location has been selected with due regard to accessibility, proximity to main and drainage channels and geographical distribution. Through the co-operation of officers of the State Rivers and Water Supply Commission, close contour plans of the blocks were obtained, and these have proved valuable

Millet growing on salt-affected land at Kerang. The sterile patches are clearly defined.

Permanent pasture successfully established on Kerang land.

in laying out the land for irrigation. In addition, the Commission has kindly agreed to supply the necessary water for the tests, and has supplied wheel meters and irrigation structures.

Apart from the question of soil types the blocks fall into two classes in regard to degree of salt damage, and have been selected as a fair representation in each case of the degree of salt damage typical of each soil type. Thus the "red plain" block at Mr. A. Kerr's, Kerang East, and Mr. J. K. McIntosh's "grey plain," Tragowel, are in general less severely affected than the "box" land block at Mr. D. J. Smith's, Koroop, and Mr. T. E. E. Bond's (soil type not classified), McMillans.

In the first two blocks the sowing of crops and pastures is being proceeded with, whereas in the last two trials the question of the best methods of watering and manuring to restore a vegetative cover is being studied first. Details of the progress made on these blocks to the end of February, 1940, are as follow:—

Red Plain Land (Macorna Clay), Mr. A. Kerr, Kerang East.

This block was selected in February, 1939, and grading was commenced, but very wet weather prevented the completion of the work. In May it was decided to sow plots of barley, oats, lucerne, Wimmera rye-grass, subterranean clover, and permanent pasture on the areas originally intended for these crops, and to carry out an investigation of the relationship between salt content of the surface soil and the germination and growth of the various species sown. This was done in co-operation with the Assistant Agricultural Research Chemist (Mr. F. Penman), and the statistical examination of the results was made by Dr. H. C. Forster. This trial showed the block to be capable of growing good crops and pastures over more than 50 per cent. of its area, and although only half the block was sown and no irrigation was done, Mr. Kerr was able to carry 135 ewes and 111 lambs on it from 10th to 22nd October. The blocks were then cleaned up by young cattle and ploughed. Grading and banking was completed and the channel and drain constructed, leaving the block in good order for autumn sowings.

A soil survey, for salt content to a depth of 5 feet, was made in collaboration with Mr. F. Penman, and the bores were lined and have been used for weekly readings of the free-water table.

A section of three bays of ½ chain width has been left ungraded for comparison with an adjoining three bays of graded land, and the whole of this section of approximately 3 acres is being used for a manurial and frequency of watering test, no crop or pasture species being sown on it.

Sowing was carried out in mid-March. Irrigation was necessary to induce germination, and generally this was satisfactory, although owing to the absence of autumn and winter rains there was no mitigation of salt effects by leaching. Late watering in such conditions must always be regarded as a risky undertaking.

In mid-June the "permanent pasture" was outstanding; Wimmera rye-grass and subterranean clover had also made good growth,

and the barley was next in order. The young lucerne was standing up well, but the oats were poor.

In early spring the oats showed recovery, and the barley plants were yellowing. The pasture plots looked well, although thinning in patches. The growth in September was marked, and the young crops were grazed by young cattle at the end of September. The "permanent pasture" recovered well.

Grey Plain Land (Kerang Clay), Mr. J. K. McIntosh, Tragowel.

Following approval of this site in July, 1939, a survey for salt content of the soil to a depth of 5 feet was made by means of bores, and the position of the free-water table was ascertained by a series of readings. A vegetation map was prepared, and the position of features such as large crab holes, large sterile patches, and old check-banks was charted. Dillon bush covered the area, and this was removed by ploughing, raking, and burning. Grading was done up to the end of December, 1939, and check-banks were made to divide the area into 40 bays of ½ chain width and 4½ to 5 chains length on the border-check system.

In January the bays assigned to summer fodders were sown, and were brought up by irrigating on 9th January and 16th January. A patchy germination was secured, but rabbits were too numerous and the plots failed. The block is portion of an area of about 10,000 acres where Dillon bush and lignum are very strongly established, and the rabbit problem in this area is as serious as that of salt damage. Around the block nearly 3,000 rabbits were poisoned at the end of February, and individual trappers were taking up to 40 pairs each night.

As at the "red plain" block, a section of six bays was reserved for a manurial and frequency of watering test in regard to efficiency in removing salt from the surface soil.

The land reserved for autumn sowings was graded, and seeding was carried out in mid-April. As at Kerang East, preparatory crops of oats and barley were sown on a big section, while lucerne "permanent pasture," Wimmera rye, and subterranean clover were sown in other sections.

The land was watered in mid-April, and this was repeated at the end of the month.

Rabbits continued to be very destructive, and re-sowing of parts was necessary, and the block was netted. Continued dry weather made early spring irrigation desirable, and after that the plots made rapid growth in September. Wimmera rye-grass was outstanding. The plots were hard grazed for three days in mid-October, but the pasture made good recovery. A programme of preparatory cropping with summer fodders is now under way.

A comprehensive series of top-dressing tests has been laid out, and in May sections of the area were sown with barley, Wimmera rye-grass, and oats. They germinated in mid-July, but made no growth.

Irrigation was carried out towards the end of August and afterwards, according to schedule. Some cereal plants appeared, but "salt weed" was the main vegetation.

Now that the land has been properly laid out regeneration of the natural herbage will be encouraged as a basis of reclamation and the introduction of better species.

Box Land (Tragowel Clay), Mr. D. J. Smith, Koroop.

The box land site is located on a bend of the Pyramid Creek, along which the main concentration of this soil type is shown on the soil survey map, and is adjacent to a drainage channel. Along the Pyramid Creek irrigation water is pumped, but a wheel meter has been installed to enable records to be kept of water used on the block.

The site was approved in August, 1939, and a soil survey for salt content to a depth of 5 feet was carried out. The position of the free-water table was ascertained by readings of these bores.

A channel was constructed, and ploughing and grading has been completed, the border-check system being adopted for the greater part of the block. Half-chain wide bays have been adopted, and on 7½ acres a frequency of watering trial combined with top-dressing tests will demonstrate the best methods to employ in the restoration of a cover of vegetation. On the remainder of the area other systems of lay-out are being tested.

Tubercle Free Herds

The following herds have been declared free of tuberculosis under the scheme conducted by the Department of Agriculture. Under this scheme a tuberculosis-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests, or, upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

ACCREDITED TUBERCLE FREE HERDS.

Name.	Address.	Number in Herd.	Name.	Address.	Number in Herd.
Banyule Stud Pty. Ltd.	Heidelberg	34	Longerenong Agricultural College	Dooen	46
Black, Estate, late I. S.	"The Cottage," Mount Noorat	46	Onley, W. H. ..	"Glenholme," Caldermeade	67
Black, Miss Grace ..	Mount Noorat ..	35	Payne, A. E. T. ..	"Yarra View," Lilydale	77
Dennis, Mrs. A. A. ..	Frankston	19	Payne, T. E. N. ..	"Woodburn," Kilmore	58
Dookie Agricultural College	Dookie	81	Powell, T. S. ..	"Carellen," Mansfield	41
Dunbar and Clark, Messrs.	"Hazeldean Dairy," Mount Dandenong	15	Read, Estate, late John D.	"Springhurst Estate," Springhurst	112
Gorman, A. W. ..	"Cathcart," Alexandra	80	Reid, Ralph G. ..	"Holmwood," Koo-wee-rup	78
Henderson, J. L. and E. I.	Wangaratta ..	95	Richardson, Bros., Messrs.	"Faldinghurst," Upper Beaconsfield	31
Holloway, R. W. ..	Caldermeade ..	57	Samuel, B. T. ..	Lang Lang ..	60
Kelly, C.	"Glenmore," Creighton's Creek, Euroa	17	School of Horticulture	Burnley	6
Lawrence, P. H. ..	"Rainga," Tarrawarra	60	State Experiment Farm	Rutherglen ..	51
			State Research Farm ..	Werribee	211

In addition to the above-mentioned herds there are 101 commercial dairy herds containing 3,047 head of cattle which may be considered free of tuberculosis. All these herds have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds, they cannot be considered as accredited under the accreditation scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

There are also 93 herds in which 4,379 head of cattle have passed one test, and may be considered therefore to be in process of becoming tuberculosis free herds.

Removal of Dew-claws of Dogs

In a great number of dogs an extra claw may be found on the inner side of the hind paws. This claw, termed the dew-claw does not touch the ground, and therefore is not kept worn down. Sometimes it becomes abnormally long and grows in curved form. As the claw grows longer it curves round till its point grows into the pad of that claw, and causes intense pain and lameness, which may be followed by abscess formation in the pad. Occasionally this curved claw may catch in some obstruction and be partially or completely torn off.

Treatment consists in shortening the claw by means of cutting forceps or strong scissors or complete removal of the claw. The latter is the best method, and is easily done with sharp scissors, one cut being sufficient in a puppy, as there is no bony attachment to the foot. No after treatment is required, as long as the wound is kept clean, and this the animal will generally do itself by licking it. Any person breeding dogs is advised to examine the puppies when born, and if dew-claws are present on any of them to snip them off when about a week old; at this age they will hardly feel the operation.

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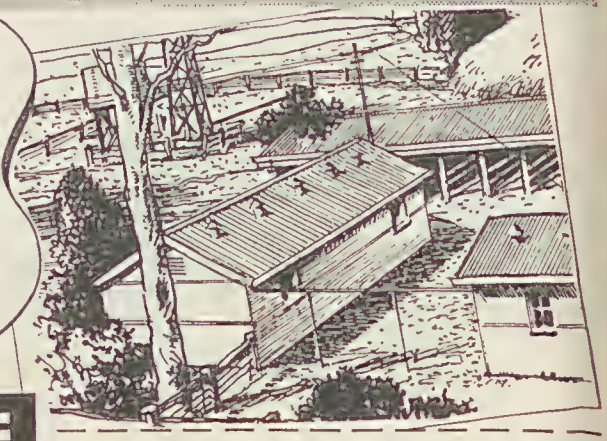

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The Journal of the DEPARTMENT of AGRICULTURE of VICTORIA

Journal of Agriculture, Victoria—February, 1941.

Wimmera Wheat Crop Championship

Report of the Judge, W. B. Miller, M.Agr.Sc., Senior Inspector of Agriculture

THE 1940 Wimmera Wheat Crop Championship was won by Mr. C. P. Dahlenburg, of Winiam East, 10 miles south-east of Nhill, with 52 acres of Ghurka wheat, which produced the certified yield of 35.1 bushels per acre. The grain was of good appearance, well filled and weighed 65½ lb. per bushel.

The contest for the Championship was the third competition held by the Farm Competitions Association in conjunction with the Royal Agricultural Society, which donated a prize of £40 for the grower of the champion crop and £10 for the district Agricultural Society which nominated the winning exhibit. In spite of the drought, nine district societies in the Wimmera continued their local competition, the best crop in each competing for the Championship of the Wimmera.

In any competition, the element of chance is present to some extent. In a crop competition, seasonal conditions may, and usually do, favour certain areas or competitors, but seldom, if ever, does an undeserving grower gain the first award. In a large district like the Wimmera, it is only by the use of the best farming methods that the coveted Championship can be won.

Seasonal Conditions.

In 1940 the Wimmera experienced the most disastrous year since the 1914 drought, when the average yield per acre was 1.2 bushels. This season the estimated yield is 8.8 bushels from 800,000 acres. Best crops were in the County of Lowan, where the estimated yield is 15 bushels per acre from 210,000 acres, and it was in this county that the champion crop was grown. The Wimmera seasonal conditions are illustrated in the following table, which includes details of the 1940 rainfall at the eleven centres where crop competitions were held, covering practically the whole of the district:—

Centre.	Average Annual Rainfall.	Rainfall, 1940.	Average Rainfall, May–November.	1940 Rainfall, May–November.	1940 May–November Rainfall as Percentage of Average.
	Inches	Inches	Inches	Inches	%
Charlton	16·7	8·0	11·4	4·6	40
Dimboola	16·0	10·8	11·4	6·5	57
Donald	15·9	7·7	10·9	4·0	37
Jeparit	14·8	9·2	10·2	5·2	51
Kaniva	17·7	14·3	13·0	8·5	65
Minyip	16·1	9·3	11·4	5·1	45
Murtoa	16·0	9·7	11·0	5·3	48
Nhill	16·1	12·7	11·5	7·6	66
Rupanyup	16·5	10·4	11·5	6·0	52
Warracknabeal ..	15·1	9·1	10·6	4·4	42
Wycheproof	14·4	8·3	9·9	4·9	49

The table indicates first that the average annual rainfall in the Wimmera ranges from 14.4 inches in the North-Eastern Wimmera at Wycheproof to 17.7 inches in the Western section near Kaniva, and that the average May-November rainfall, which counts most in the crop production, varies from 9.9 inches at Wycheproof to 13.0 inches at Kaniva. However, the incidence of seasonal variations is so dissimilar that any of the districts mentioned may produce heavier crops than any of the other districts, and, as far as the competition is concerned, the Champion Crop may be grown in any part of the Wimmera.

This season, as shown in the last columns of the table, the May-November rainfall varied from about 4 inches at Donald and Warracknabeal to over 8 inches at Kaniva. At six centres this rainfall over the growing period was less than half that of a normal year. At no centre was the rainfall in the growing period as low as that of 1914, but in the months of May to October it was very little more at most centres. The comparative high average yield of 8.8 bushels this season as compared with 1.2 in 1914 is due partly to the slightly better rainfall, but principally to the cultivation methods now in use and the drought-resistant varieties since produced by the plant breeders and agronomists of the Department of Agriculture. Regarding cultivation methods, it is interesting to note that 78 per cent. of the 1914 Wimmera crop was sown on fallow land, while last year this figure had increased to 94 per cent. Since 1914, Federation and the old wheats have been completely superseded by such varieties as Ghurka, Dundee, and Ranee 4H, and to their existence much of the credit for the yield obtained this year must be given.

In 1936 the record Victorian yield of 17.9 bushels per acre was produced, and in the year following this record was broken with an average yield of 17.93 bushels. A drought occurred in 1938. Only once in the history of the Victorian wheat belt have two droughts been experienced in three years, namely, in 1927 and 1929, and these were not so intense as those of 1938 and 1940.

That the Wimmera District has not lost its capacity to grow wheat is shown by the yield of the three years 1935, 1936, and 1937, when the District produced an average of 23.7 bushels per acre from an area of 766,000 acres. This yield exceeded any previously obtained in the Wimmera for three consecutive seasons. No other district of similar size in the Commonwealth can show such a high return and the black soils of the Wimmera must be the most consistent wheat-producing areas in Australia.

Of the three Wimmera Counties, Borung is the most prolific over a long period, but it is interesting to note that the Champion Crop for the last three years has been produced in the Western County of Lowan.

A drought is followed usually by a season considerably better than average, but this is not always the case, and the most prolific years have not been those immediately following a drought season.

Progress in Wheat-growing Methods.

During the prolific seasons of 1936 and 1937, the statement was sometimes heard that optimum yields per acre probably had been reached, yet in these seasons it was demonstrated that the standard variety, Ghurka, was likely to be superseded by the new wheats Magnet and the crossbred Ghurka x C.M.G., now named Quadrat.

These varieties are now being distributed, and their use will raise both the average yield and grain quality of Wimmera wheat. Nor should this be the end, for it is confidently expected that still further progress will be made in the production of improved varieties. Drought-resistant wheats are not the only objective. Varieties which can take maximum advantage of good seasons are required, as the average yield over a period is the main consideration.

Varieties recommended for the Wimmera are:—

—	Main Sowing.	Limited Sowing.
Wimmera black land ..	Ghurka	Magnet Quadrat (Ghurka × C.M.G.) Baldmin
Wimmera red and mixed land	Ghurka	Ranee 4H Dundee Baldmin

In 1936 and 1937 the Department of Agriculture discovered the possibilities of the economic use of zinc sulphate in conjunction with superphosphate in increasing the yield on large areas of black land in the Western and Southern Wimmera. This discovery was made on the farm of Mr. C. P. Dahlenburg, where much of the subsequent experimental work has been conducted. Some 35,000 acres in the Western Wimmera were treated with the super.-zinc mixture in 1940, and it is probable that this result of the Department's research work will play an important part in

Mr. C. P. Dahlenburg's champion crop of Ghurka wheat—yield 35·1 bushels per acre.

Wimmera wheat-growing methods of the future. The champion crop had been manured with 7 lb. of zinc sulphate per acre throughout, in addition to superphosphate. The same land was treated with 15 lb. super.-zinc in 1938 and strips left untreated in that year were quite obviously inferior.

In other directions also there remains much scope for investigation, particularly in regard to the influence of the rotation of crops and the effects of spelling the land under grazing on the fertility of the soil. On this aspect it is of interest to note the rotations practised by the growers of the champion crops during the past three years:—

1938—H. Cramer; rotation, oats (grazed)-fallow-wheat.

1939—L. Clark; rotation, oats-fallow-wheat.

1940—C. P. Dahlenburg; rotation, fallow-wheat almost continuously (grass in 1934).

In each case, the land was summer fallowed, i.e., in the summer or autumn of the year prior to that of sowing.

It is recognized that higher average yields per acre will be obtained, even from the rich black land, if it is spelled occasionally in grazing, either of oats or pasture, rather than by continuously cropping on fallow, following wheat. Such spelling, however, does not appear to be so necessary as it is on the less fertile red land.

The wheat-growing industry is facing many difficulties, including the immediate problem of man-power during the present crisis. Various items in the cost of production have risen and are likely to do so to a greater extent. It is therefore more important than ever to produce maximum yields per acre provided that each method adopted is in itself profitable. Whatever may be the area sown to wheat, it is in both the National and individual interest that growers should attain the maximum efficiency by producing prolific crops. The Crop Competition movement has already done much to achieve this end and the Department of Agriculture strongly recommends the continuance of these competitions so far as is practicable.

The Championship competitions sponsored by the Royal Agricultural Society have stimulated the movement, 226 crops being judged in the Wimmera in 1939. In these difficult days it may be impossible or too much to expect any expansion, and the provision of judges presents a problem when there is other urgent work to accomplish. On the other hand, the Department considers that the conducting of Crop Competitions is one of the most useful forms of extension work, providing an opportunity for the interchange of information between farmers and officers on the farm, and at the

time of the year when the results of the methods adopted to meet the varying conditions are demonstrated in the crops prior to harvest.

The Champion Crop.

The Champion Crop produced by Mr. C. P. Dahlenburg was grown by the use of methods now generally used by him in the cultivation of his black land. His usual annual area sown to wheat is approximately 600 acres, to handle which he employs both tractor and horses.

The winning area of 52 acres was the major part of a paddock of 62 acres of rising black ground typical of large areas in the western Wimmera. It was the fourth wheat crop sown on the area during the past nine years, the rotation practised being wheat on fallow every second year with very occasional spells out for one year to oats or self-sown pasture. The land is kept reasonably free from weeds by the regular use of summer fallow, prompt cultivation when required, and the use of sheep.

On this occasion, after burning the stubble as usual, the paddock was scarified to a depth of 3½ inches under dry conditions early in April. Soon afterwards 2 inches of rain fell, making a further crosswise scarifying necessary to kill the germinating charlock. The season turned out to be a wet one, over an inch of rain falling each month from April to November, with a total for those eight months of 15 inches. The fallow therefore was worked frequently, being scarified in July, shear harrowed in August, combined (rigid tyne) in September, and shear harrowed in November. Shortly afterwards it was judged in the Nhill fallow competition, being awarded one point less than the winning fallow.

To catch the weeds, the useful knife bar was used in the second week of February. It was not necessary to cultivate immediately after the April rain, and the crop was sown with the combine during the third week of May, and harrowed immediately afterwards as a separate operation.

Seventy pounds of Ghurka seed pickled with mercurial dry pickle was applied per acre, the seed originating from the Mallee Research Station, Walpeup.

As mentioned earlier, super.-zinc was used at the rate of 90 lb. of superphosphate and 7 lb. of crystalline zinc sulphate per acre, mixed on the farm just prior to sowing. When at the four-leaf stage in June the crop was trimmed off by sheep, but such an operation can hardly be termed "feeding off." Mr. Dahlenburg normally sows a little earlier than many Wimmera farmers on black land, and trims the crop back with sheep in June or early July. This is very different from heavy grazing at the end of July or early in August, which practice, although advantageous to the sheep, usually results in reducing the wheat yield.

The resulting crop was, for a dry season, thick and well headed. In the heavier patches on the flat, some of the spikelets contained three grains which could be attributed to the extra water running there in April or before. But for such natural variations and a few weak patches on the rise, the crop was very even. A few wild oats, some iron weed, and charlock were noticed, but the yield was only slightly affected thereby. Diseases, for all practical purposes, were apparently absent. The crop was the best produced on this paddock for many years, and when harvested with a 12-ft. auto-header in the presence of an officer of the Department of Agriculture, yielded up to its appearance, the certified yield being 35.1 bushels acre.

Other Competitors.

The Ghurka crop grown by Mr. G. Mock on the property of Mr. A. E. Sanders at Kaniva South was the second best in the contest. On outward appearance it was thicker than the Champion crop, but the heads were small. Close examination just before it was ripe revealed the presence of a large proportion of shrivelled grain resulting apparently from an attack of "take-all" and foot-rot, which diseases were discovered on many of the plants examined.

Such wheat is very difficult to judge, and this crop, which yielded considerably less than the champion, was disappointing to both the grower and the judge of the local competition. Nevertheless, it was a fine crop for the season, and one with which most growers would have been satisfied. Such an occurrence of disease is not unusual on land fallowed after growing grass for many years. The foot-rot diseases multiply on the roots of grasses and are not completely eradicated during fallowing. Under certain conditions, not yet thoroughly understood, the wheat crop grown on such a fallow suffers badly, and it is fortunate that these diseases seldom take a very heavy toll.

From existing knowledge, practical advice to rapidly and completely eradicate "take-all" and foot-rot cannot be given, and more research on the problem is urgently required. It is considered desirable, however, to burn the grass

Mr. George Mock of Kaniva stripping his crop of Ghurka, which won the Kaniva competition and was runner-up for the Wimmera championship.

before summer-fallowing and to cultivate thoroughly. The inclusion of oats in the rotation will assist also, but this is not always practicable on large areas.

In this case, the land had been out to grass for ten years prior to 1937, grew a fair crop in the 1938 drought, and was scarified in May, 1939, to a depth of 3½ inches. The spring-tooth combine was used in July and October, and the scarifier with harrows in November and early May. The fallow was placed equal first in the 1939 competition. Sowing took place early in June, using 100 lb. of super. plus 10 lb. of zinc sulphate per acre. The crop was not sheeped, was observed to suffer during the dry spell early in September, but recovered well until attacked by the diseases.

All the other districts represented received less rainfall than Nhill and Kaniva. The eight-bag crop of Ghurka grown by Messrs. W. G. and O. C. Pietsch at Dimboola was a good example of what can now be grown on a light rainfall. At Dimboola Post Office, 8 miles south-west, the official rainfall for the May-November period was 649 points, but some miles to the north-east the season was almost as dry as at Warracknabeal, i.e., 439 points for the seven months. The crop was grown in three-course rotation, fallow-wheat-grass, was sown in mid-May, and struggled to survive throughout the season. It was not sheeped, and in September appeared quite brown until the showers came late in the month. The result was a typical light crop, naturally with smaller heads than usual, but wonderfully prolific for the conditions. Super.-zinc was not used on this crop, but it has been demonstrated to give results some miles east of Dimboola.

At Lorquon, slightly more rainfall was received, but the crop of Bobin shown by Mr. E. G. Nuske to win the Jeparit competition was outstanding for such a season. It was grown on red loam, fallowed in the standard manner, and was estimated to yield between eight and nine bags per acre. Bobin is an early maturing variety which appears to be quite suitable for red land in the Wimmera, and is included in the new series of variety trials commenced last year at Warracknabeal.

At Donald, which area suffered as severely as any part of the State, Messrs. A. Bugge and Sons won the local competition with one of the few fair crops in the district, but could not rival the crops in the West Wimmera. A similar unfortunate position was evident at the other centres, the competitors being: Murtoa (Mr. O. C. Petering), Minyip (Mr. A. E. Petering), Warracknabeal (Mr. L. R. Rodda), and Charlton (Mr. C. Parish).

The methods by which these crops were grown are described in the reports of the district competitions, which have been published in full in the local press.

The only centres to abandon their competitions because of the drought were Rupanyup and Wycheproof. It is expected that all the competitions will, if practicable, be continued in 1941.

School of Dairy Technology

Particulars of 1941 Course

Applications for enrolment for the present year's course at the School of Dairy Technology, Werribee, will close on the 28th February, 1941. Intending students possessing the necessary factory experience should make application before that date to the Superintendent of Dairying, Department of Agriculture, Melbourne, from whom copies of the prospectus may be obtained. The applicant should state whether butter or cheese is the intended study.

THE School of Dairy Technology is situated on the State Research Farm, about one mile from Werribee, and comprises a fully equipped experimental dairy factory with facilities for the manufacture of butter and cheese, up-to-date laboratories for the study of technical subjects allied to dairy manufacture, lecture rooms, students' common room, library, and research laboratories. Class room and laboratory accommodation are sufficient for the enrolment of ten selected students per year.

Instruction is provided by a staff of specialists fully qualified to deal with all phases of dairy manufacture.

The Course in Dairy Manufacture.

The course in dairy manufacture offered by the school has been designed to provide dairy factory operatives with a sound general training in all matters likely to have a bearing on their work in dairy factories. Briefly its aims are:—

(1) To furnish students with up-to-date knowledge concerning the practices adopted in the manufacture of dairy products.

(2) To provide students with a general understanding of the various sciences underlying dairy manufacturing processes.

(3) To provide students with a good working knowledge of the business side of the industry, including the keeping of accounts and the management of dairy factories.

Two options of the course are available, namely—(*a*) butter-making, (*b*) cheese-making. Candidates must decide prior to enrolment which of these sections they desire to take. The subjects of study are as follow:—

First Year—

Elementary Chemistry and Physics.
Elementary Bacteriology.
Dairying.
Elementary Bookkeeping.
Butter-making 1, or Cheese-making 1.

Second Year—

Dairy Chemistry.
Dairy Bacteriology.
Factory Bookkeeping and Management.
Dairy Engineering and Factory Construction.
Butter-making 2, or Cheese-making 2.

The course will include also adequate practical and demonstration work in the experimental dairy factory.

The course extends over two winter terms each of approximately sixteen weeks' duration, commencing on or about 1st May, and ending on or about 20th August each year.

Candidates must be at least eighteen years of age before commencing the course, and will be required to submit satisfactory evidence of experience in all branches of factory work. The minimum length of experience required will be at least two seasons.

Candidates are required to produce evidence of having attained to a reasonable standard of education. A merit certificate will be regarded as satisfactory for the purpose. Where deemed necessary, an intending student may be called upon to undergo a general educational test.

To complete the course for the certificate of competency in dairy manufactures the student must attend two terms in successive years, passing the examinations set by the instructors at the end of each term.

In making application for enrolment the candidate must clearly indicate which section of dairy manufacture he wishes to study—butter manufacture or cheese manufacture—and the section chosen will be stated on his certificate. Should any student desire to complete both sections, a third term on the remaining subjects would be necessary as well as the

[*Continued on page 84.*

Meat Export Restrictions

Their Effect on Pig Raisers

By L. A. Downey, H.D.A., Pig Expert

THE shortage of insulated ships to carry meat sold by Australia to the United Kingdom under contract between the two Governments has necessitated the storage of meats in Australia; and in Victoria, for the past few months, has caused pig values to fall below what was expected to be export parity to growers.

The recently announced restrictions which preclude the export to the United Kingdom of pork from pigs of porker weight and from chopper pigs and of pork offals, which include livers, hearts, kidneys, and tongues, are of direct interest to pig raisers.

The exclusion of pork offals from the export trade with the United Kingdom may be expected to have a slightly depressing effect on the pig industry, but as these offals have a high nutritive value it is possible that satisfactory means of marketing them may be found.

The exclusion of porker weight pork, that is, pigs weighing less than 110 lb. dressed, from export need not cause a serious loss to the industry provided certain precautions are taken by producers in changing over from porker to baconer production.

Despite warnings issued for the last three years to the effect that, in view of the United Kingdom's demand for bacon, and the increasing influence of that market on the whole Australian pig trade, any increase in pig production should be of pigs of baconer type and weight, some pig raisers have concentrated on porker production. Others, while attempting to grow baconer pigs, have been caught by the shortage of foodstuffs and the rising prices of grains and mill offal, and these factors have forced them to sell at porker weights, pigs which were intended for the baconer market.

How the situation may be met.

Victoria still has a considerable local market for porkers, but with their exclusion from the export trade a glut of porkers should be expected if growers do not hold back more of these pigs until they reach baconer weight. In doing so, however, modified feeding methods must be adopted if these pigs are to be in saleable condition when they reach baconer weights.

The procedure recommended is to feed restricted rations of concentrated foods with the object of allowing pigs to grow larger frames before they are finished off at baconer weights. Even though such pigs will grow their frames comparatively slowly and so take a long time to reach baconer weights, such a procedure is desirable so that these porker type pigs will not be excessively fat when they are sold at baconer weights.

During the slow growing period such pigs may be fed pasture, silage, chaff, waste fruit, root and forage crops as available, with limited quantities of grain meals or milk, and in this way food costs may be reduced.

The weight range for exportable baconer pigs is from 110 to 180 lb. dressed.

Baconers not up to Standard.

Pigs which, on normal feeding, reach prime condition at porker weight give undesirably short, thick, and over-fat carcasses if carried on rapidly to baconer weights. The presence of many pigs of this class has always been a serious problem in the bacon trade and the United Kingdom Government has stressed that excessively fat pigs are not wanted and so must be graded down and paid for at differential prices.

After the 28th February all pig meats for export to the United Kingdom must be cut into "Wiltshire" sides, and thus the thickness of the back-fat will be exposed for grading.

Pig raisers can do much to help themselves individually and the industry generally by breeding from the larger and longer framed type of pigs, whose progeny when fed on full ration grow rapidly to baconer weights without becoming excessively fat. Those pig raisers who are using the more compact type of breeding

stock should endeavour to change to the larger type, but in the meantime should grow their porker type pigs slowly on restricted diets and/or market their pigs at the lightest possible baconer weights, i.e., just over 110 lb. dressed.

Baconer pigs should be marketed when "fit but not fat," irrespective of their weights, provided they fall within the 110 to 180 lb. range.

Disposal of Choppers.

The restriction on the export of chopper pigs will affect their market value. A sharp decline in values may, however, be avoided if growers refrain from rushing culled sows to market just now.

Sows which are to be culled from the breeding herd should be kept away from the boar and where practicable given good grazing and such cheap foods as waste fruit, silage, hay, &c. where these are available, and with little or no expensive concentrated foods empty sows can be brought slowly to fat marketable condition.

Although the rearrangement of the porker export trade will cause some upset in the pig industry, an appreciable contribution has been made, particularly by the change to "Wiltshire" sides, to the relief of the shipping position, and an ultimate benefit should result to the baconer export trade, which has a quota of 24,000 tons for the current year's contract.

War Saving Certificates

The Last Shilling—If Necessary

This is a *total* war, and Australia's must be a *total* effort if we are to take our share of the Empire's fight for freedom. In this country we are still privileged to grumble about taxes and other annoying things. In England, which is our front line of defence, the people are not grumbling about taxes. They are fighting for their very existence, and living in the hell brought by Hitler's bombers. Not only are they fighting a ruthless foe, but they are paying record taxes to finance their fight. For them there is no respite. Sheltering underground, they snatch sleep whenever they can. Tired, they walk to work from the shelters, often with the roar of aerial battle in their ears and bombs battering the streets.

How different in Australia! Untouched by the scars of war, life goes on almost normally, sport and holidays are uninterrupted, and all we know of bombers is the tragic daily story we read of our kinsmen's terrible sufferings, of the slaughter of civilians, men, women, and children, and of hospitals razed to the ground.

In Australia we are asked to help the Government find some of the colossal sums of money needed to equip our fighting forces so that when they meet the enemy it will be at least on equal terms.

A million and a half Australians are subscribing to more than 20,000 War Savings Certificates Groups. They have made a substantial contribution to the £16,000,000 raised so far towards the Commonwealth's war commitments. By weekly payments they have been buying one or more of the £1 certificates. But now that the first cycle of payments is being completed, many of them show an inclination to "call it a day" and to drop out of their groups. This attitude is unworthy and dangerous. It is unthinkable that Australians should be ready to dismiss so lightly their obligations to themselves and to their own fighting men who have gone overseas in defence of this country.

The Federal Treasurer (Mr. A. W. Fadden) has issued a warning that any slackening of our effort simply cannot be contemplated. He urges subscribers to savings groups to continue, and on an increasing scale, the effort they have begun so well. "Everybody," he says, "must get down to the job of making every possible shilling available to the Government. The only alternative to the fulfilment of Australia's loan programme is still higher taxation. I don't say that by way of a threat, but a sober statement of fact which reasonable people will accept and act upon."

As in 1914-18, it must be the Last Shilling—If Necessary.

By W. R. Jewell, M.Sc., Agricultural Research Chemist

THE practice of liming the soil is one of the oldest operations in agriculture. In countries which have been farmed for centuries the present fertility of certain soil types is due largely to this practice. In newer countries the necessity for liming is not so apparent, and lime is not used on such a wide-spread scale. A few years ago there was a marked local increase in the use of lime for agricultural purposes, and this interest in lime in Victoria has been maintained, at least to a certain extent. This may be due partly to an awakening by the farming community to an interest in the results obtainable from liming, partly to an active campaign on the part of firms marketing agricultural lime, and partly to the fact that agricultural lime costs less per ton than fertilizers. Some farmers believe that they can save on their fertilizer bill by substituting lime for, say, superphosphate. In some cases they have been led to this wrong conclusion by certain vendors of agricultural lime who have claimed that lime is a fertilizer and can be used in the place of superphosphate. This is not so, however, as will be explained later in this article.

The awakened interest in agricultural lime has been reflected in the numerous inquiries received from farmers as to whether lime is likely to be of benefit to their particular soil, whether it can replace fertilizers, and what is the best form of lime to use. There has been a tendency on the part of a few salesmen to push the sale of lime, irrespective of whether it is likely to be of value to the particular farmer or not, and even in districts where the soils are already amply supplied with lime, and where the addition of further lime would be equivalent to carting coals to Newcastle. Further, in some cases extravagant claims have been made for particular brands and types of lime. While lime definitely has its function to perform in agriculture, in view of the foregoing remarks it seems desirable to deal briefly with the general question of the use of agricultural lime, and the limitations as to its function, and also to clear up any misconceptions existing in the minds of prospective users.

Forms of Lime.

Lime may be applied to the soil in a number of different forms, as outlined below:—

Quick Lime, otherwise known as lime oxide, burnt lime, caustic lime, or lump lime, is obtained by the burning of limestone rock in

lime kilns. This form of lime, when applied to the soil, rapidly becomes slaked, due to the absorption of moisture either from the soil or from the atmosphere, or from both, and then reverts to the state of carbonate of lime, in which it existed before it was burnt. Any virtue it has lies in the fact that, if well burnt, it naturally falls into a fine state of subdivision, and some of it is soluble. Therefore it may act with greater rapidity than some other forms of lime. Quick lime possibly may have an immediate detrimental action when applied in that, because of its caustic nature, it may adversely affect organic matter and some forms of bacteria that may be present in the soil. In Victoria, quick lime for agricultural purposes usually is sold in a ground condition, which ensures more even distribution. Ground lime, however, quickly absorbs moisture, which makes storage without deterioration difficult.

Slaked Lime or lime hydroxide is formed when quick lime is acted on by water, either applied direct or taken up from the atmosphere, and is usually in a fine state of subdivision. Slaked lime is not as caustic in its action as quick lime, and, because it is more soluble in water than calcium carbonate, it may have a more rapid action on the soil, and be of particular benefit to heavy clay soils. Slaked lime, however, like quick lime, rapidly absorbs carbon dioxide from the air, and readily reverts to the carbonate form after application to the soil.

Carbonate of Lime or ground limestone is the unburnt limestone ground to a fine powder. The term also includes soft lime, marl, chalk, shells, &c. Generally speaking, carbonate of lime is as suitable as other forms of lime, and, in some circumstances, has advantages, provided it is sufficiently finely ground and reasonably free from impurities. It is not harmful in heavy dressings, is less unpleasant to handle and apply, and can be stored indefinitely without fear of deterioration or destruction of the bags. When considering the suitability of ground limestone, the degree of fineness is of paramount importance, particularly when the source of supply is a hard, dense rock. Sea shells, which are really calcium carbonate, frequently remain unaltered in the soil for years. In the same way, large lumps of rock limestone will be of very little value as a liming material; the only process of disintegration of calcium carbonate in the soil is that of solution. When the source of supply is a soft natural limestone, fine grinding is still essential, but the degree of subdivision need not be so great as with a hard limestone rock. In the case of the softer material, moisture can pass through the small lumps and thus hasten solution. There is evidence to suggest that limestone rock should be so ground that all the material passes through a 40-mesh sieve and that at least 90 per cent. should pass through a 100-mesh sieve. With ground soft limestone it is desirable that all the material should pass through a 10-mesh sieve.

Mixtures.—Although not in common use, a mixture of two or more of the foregoing types of lime is sometimes marketed from the waste material around a lime kiln.

Waste Lime Products.—In addition to the common forms of lime mentioned above, waste lime products are at times available from certain industrial processes. In some cases, the product is a relatively pure form of carbonate of lime, when it may be sold as such without any reference to its origin. Lime is also obtained as a waste by-product from calcium carbide used in acetylene production. This material is mainly in the form of hydroxide or carbonate (depending on its age) and is suitable for agricultural purposes, provided it has aged sufficiently to ensure the removal of impurities which might be harmful to plant life; it should never be used when fresh, but only after exposure to the weather.

Another waste product is the lime-press cake from a beet-sugar factory, limited in Victoria to the Maffra district only. However, at the price for which this material is available, it is an excellent source of agricultural lime for farmers in the immediate neighbourhood. It, also, is in the form of carbonate, and its quality depends primarily on the amount of moisture it carries.

Waste tannery lime contains ingredients (including sulphides) which are injurious to plants. Such material should not be used for agricultural purposes until exposed to the air for many months. Waste lime products usually possess one or more disadvantages, but are frequently of value in the limited area

adjacent to the source of supply and at the price for which they are usually available.

Other Lime Compounds.—Other compounds containing lime are used in agriculture, e.g., phosphate of lime (superphosphate) and sulphate of lime (gypsum). Although not primarily employed for the purpose, such materials supply lime to the soil, but have no power of neutralizing soil acidity, and are not classed as agricultural lime.

Relative Values.

In most cases there is little to choose between the ultimate effects of various forms of lime, and as calcium carbonate properly ground is as suitable as other forms, and in some respects more advantageous, it seems, on the face of it, an unnecessary expense to go to the trouble of burning it for agricultural purposes. These various forms of lime, however, contain different amounts of actual lime (calcium) oxide. It will be apparent, therefore, that different amounts of each will be required to supply the same amount of lime per acre to have the same effect on the soil. Roughly speaking, 56 lb. of burnt lime is equivalent to 75 lb. of slaked lime, and each of these is equivalent to approximately 100 lb. of ground limestone. Hence, approximately 1¾ to 2 tons of ground limestone or carbonate of lime would supply as much effective "lime", and have the same neutralizing effect, as 1 ton of quick lime.

It would appear, therefore, that the ultimate basis on which to assess the value of various brands and forms of agricultural lime is on the price per "unit of lime" oxide distributed on the farm. By "unit of lime" is meant each 1 per cent. of lime oxide per ton of material. For example, relatively pure burnt lime must cost less than approximately twice as much as ground limestone on the farm, if it is to be preferred to the latter. Again, in some cases, very impure limestones or marls may be more economical than pure ground limestone, provided the former can be obtained and distributed at a lower cost per unit of lime. It is essential, therefore, that the lime content should be known, together with the cost per ton landed on the farm, before it is possible to determine which of several types is the most economical. When comparing different brands of the one type of lime, the matter is a little simpler. For instance, if one brand of ground limestone contains 95 per cent. of calcium carbonate and can be obtained for, say, 25s. per ton on the farm, then any other brand containing less than this amount of calcium carbonate cannot be as economical unless it can be obtained at a proportionately lower price, assuming, of course, that the degree of subdivision is satisfactory in both samples.

Control of Sale of Lime.

The sale of agricultural lime is controlled by the Agricultural Lime Act. Each bag of lime must carry a label which shows the name

Spreading lime with mechanical broadcaster.

and address of the manufacturer, the brand and type of lime, and an analysis. The actual content of calcium oxide must be stated, together with the form (oxide, hydroxide, or carbonate) in which it occurs and its equivalent in terms of calcium carbonate. Most limestone contains a small amount of magnesium carbonate, which remains as magnesium oxide after burning and as hydroxide after slaking. The amount of magnesium oxide present must also be shown in the analysis on the label. Fineness of grinding is of great importance, therefore the proportion of the material passing through a 20-mesh sieve must be stated, as an indication of the degree of fineness.

The Act also requires that an invoice certificate, showing the quantity purchased and the analysis, &c., must be supplied with each lot of lime sold. A list of all registered brands, together with analyses and prices per ton, is published each year in the *Journal of the Department of Agriculture,* and will be found useful in assessing the relative values of different brands available, along the lines already indicated. The farmer should not purchase an unregistered brand nor accept delivery of any agricultural lime not labelled as required by the Act.

Effects of Lime on Soil.

Lime performs a number of functions in the soil, which are briefly dealt with hereunder:—

1. Probably the most important effect of lime on soil is the correction of soil acidity. It has been established that many crops and plants will not reach maximum production when the reaction of the soil is lower than a certain degree of acidity. For instance, sugar beet and lucerne prefer a soil with a somewhat alkaline reaction. Wheat, and most grasses and cereals, do equally well over a range of soils from slightly acid to slightly alkaline. Potatoes, on the other hand, do best in decidedly acid soil. When considering the desirability of liming, the type of crop to be grown, therefore, has some importance. Lime, of course, reduces soil acidity by neutralizing the acids present, and the amount of lime necessary will depend on the degree of acidity, soil type and the crop to be grown.

2. Lime is an essential plant food, and the addition of lime may be necessary to remedy a deficiency of that material in the soil. That is to say, apart from the effect of soil reaction itself on plant growth, there may be insufficient lime present to supply the plants' normal requirements; under these conditions, lime would be necessary apart from any correcting of soil acidity. Some plants, e.g., legumes, lucerne, &c., have a greater requirement for lime than have other crops. Lime is a constituent of all crops, and their removal, either directly or indirectly through stock, reduces the lime status of the soil. Further and larger amounts of lime are lost from soils by leaching with rain water, charged with carbon dioxide.

3. Lime can have a beneficial effect on most heavy clay soils, making them more friable and open. It has a flocculating action, causing very fine particles of clay to flocculate together into larger particles, resulting in a much better physical texture. It has been claimed that lime also has a beneficial action in closing up light sandy soils, but the effect of any such action is probably negligible.

4. Liming, by reducing soil acidity, may improve the bacterial activity in the soil, and also, to a certain extent, may increase the availibility of other plant foods present in the soil.

Lime Not a Fertilizer.

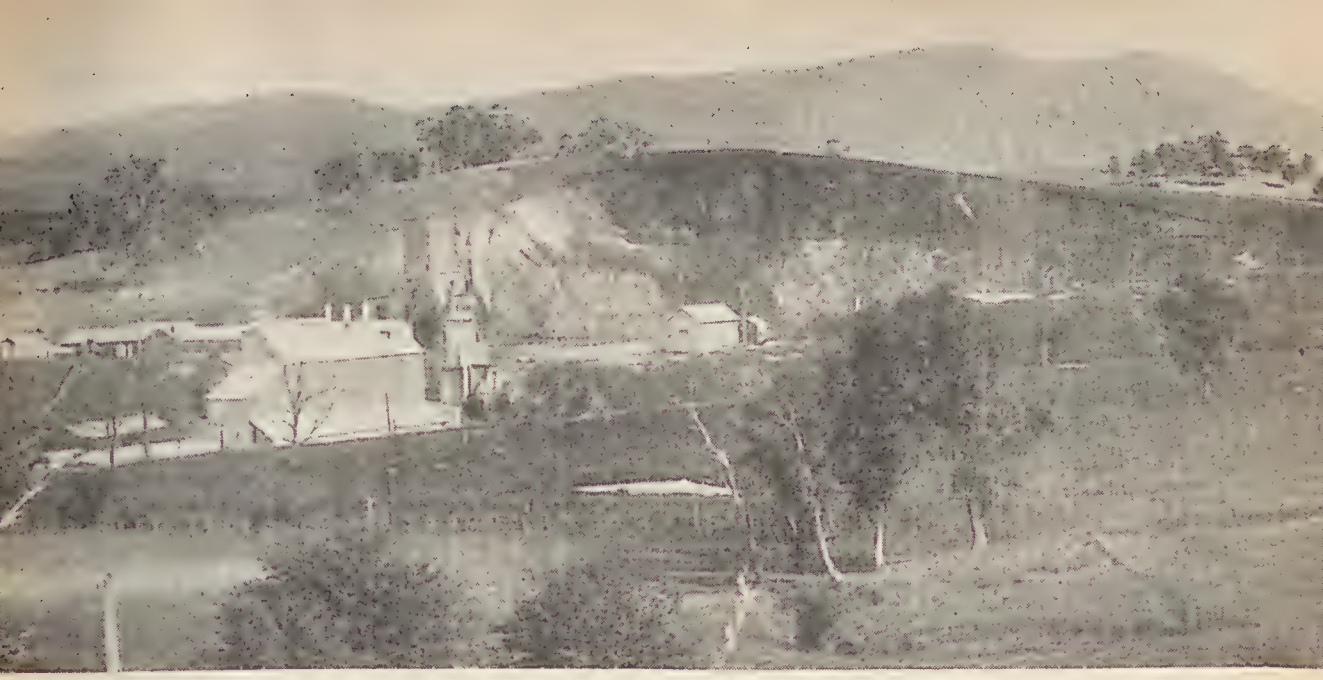
Lime is of value for the reasons outlined, and it performs so many functions that it is usually referred to as a soil improver. Although it supplies lime as a plant food, lime should not be considered as a fertilizer in the general sense of the term, nor can it take the place of the usual fertilizers, in spite of certain types of sales propaganda to the contrary.

A farmer must realize that he applies lime to correct certain soil conditions, but, if a soil be deficient in, say, phosphoric acid, no amount of lime can make up this deficiency, and some form of phosphatic fertilizer is essential, whether lime is used or not. Again, in most instances, lime to be of benefit must be applied very much more heavily than is the case with fertilizers. Lime has its place in agricultural practices, but not as a substitute for fertilizers.

Lime in Victoria.

As suggested earlier in this article, the need for lime in Victoria is not as pronounced as in certain other countries of different climatic conditions, and where agriculture has been practised for centuries. While the necessity for liming in Victoria is limited, there is little doubt that there are large areas which would

[*Continued on page 79.*



A Large Country Lime Quarry and Works.

The Agricultural Lime Act

Brands Registered for 1941

By W. C. Robertson, Chemist

AN ACT relating to the sale of agricultural lime was passed by the Victorian Parliament during 1934. Agricultural lime is defined under the Act as Calcium Oxide (CaO), Calcium Hydrate ($Ca(OH)_2$), Calcium Carbonate ($CaCO_3$) or any material containing any one or more of these compounds sold or intended to be used for application to the soil, but does not include any fertiliser within the meaning of the *Fertilisers Act* 1928.

The definition covers materials such as ground limestone, marble, dolomite, chalk, calcareous marl or any residual lime produced as a by-product from certain works or factories as for example sugar refineries, tanneries, gas works or acetylene plants.

Residual lime sometimes contains chemicals which have an injurious effect on plant growth; it is prudent, therefore, to have the lime from these sources tested prior to use.

Lime from heaps which have been exposed to the weather for some years may be regarded as quite safe to use without this precaution. Lime of this description is variously termed "mild" or "carbonate" lime and it is the least active of any of the three forms namely, carbonate, hydrate or oxide.

It is in the carbonate condition that lime has been utilised for centuries past in agriculture as a soil ameliorator. The value of agricultural lime in the carbonate form will depend upon (*a*) the percentage of calcium oxide (CaO) it contains and (*b*) its mechanical condition, i.e., the degree of fineness. However, there is a limit in the case of the latter because of the cost of fine grinding and the floating of the fine powder creating trouble and annoyance during spreading.

Carbonate lime (calcium carbonate or limestone) when burnt at a high temperature in a suitable kiln which has a good draught becomes dissociated into lime (CaO) and carbonic acid gas (CO_2). Prepared in this manner lime is variously termed stone, fat,

roche, quick, unslaked or burnt lime. The quality will vary with the purity of the limestone burnt and the efficiency of the lime burner and his plant. Generally speaking available lime (CaO) in the finished product approximates 90 per cent.

The usual test for the quick determination of the quality of burnt lime in commerce consists in subjecting it to a water spray with which it should instantly combine with the evolution of considerable heat and a marked increase in volume, swelling to 2½ times the original bulk.

At the end of the reaction the lime so treated is in a state of a very fine, light, white powder and is known as water-slaked lime, calcium hydrate or calcium hydroxide having the formula $Ca(OH)_2$ or $CaO.H_2O$ where CaO represents lime and H_2O water.

Burnt lime which produces a slow reaction and contains hard lumps of unburnt stone is regarded as "poor" lime in which the percentage of caustic or available lime (CaO) is relatively low.

Lime containing hard pieces of cinder-like fused rock is termed "overburnt" and the condition is due to excessive heat in the kiln during burning. Faulty lime of this description while not complying with the specifications required by the chemical, industrial and building trades is eminently suitable for use as an agricultural lime.

When burnt lime of any quality is exposed to the weather it becomes air-slaked, the rapidity of the reaction depending upon the purity of the lime and the atmospheric conditions.

Air-slaked lime differs from the water-slaked in that it is a mixture of calcium oxide (CaO), calcium hydrate ($Ca(OH)_2$) and calcium carbonate ($CaCO_2$). Prolonged exposure will gradually convert the air-slaked (and the water-slaked) product wholly into the carbonate, i.e., calcium carbonate, or as it is more commonly, though incorrectly, called: carbonate of lime.

From these facts it may be gathered that:—

(1) Lime exists in various forms namely:—

(*a*) Burnt lime (CaO).

(*b*) Slaked lime ($Ca(OH)_2$) or ($CaO.H_2O$) in which the lime is slaked with water.

(*c*) Air-slaked lime ($CaO\text{-}Ca(OH)_2\text{-}CaCO_3$) in which the lime is more or less slaked and carbonated by the weather.

(*d*) Carbonate lime or more correctly calcium carbonate ($CaCO_3$) in which the lime exists in the common natural state.

(2) Lime in the burnt form (CaO) reverts to its original condition—the carbonate ($CaCO_3$)—by exposure to the elements and therefore when burnt lime is applied to pasture it quickly undergoes the following changes:—burnt lime (CaO) to air-slaked lime ($CaO\text{-}Ca(OH)_2\text{-}CaCO_3$) to carbonate lime ($CaCO_3$) so that it would appear to be a waste of time and money to subject calcium carbonate to the burning process if it is required for top-dressing pasture.

Burnt lime under certain conditions has a temporarily injurious effect on pasture and its growth. However, where the texture of the soil is so heavy that cultivation is difficult and costly it is necessary to use lime in the burnt form in comparatively heavy quantity to bring about the required improvement in the physical condition.

Lime for use as a fungicide or insecticide or as a raw material in the preparation or manufacture of pest destroyers must not only be burnt lime but it should be of the highest quality and is not to be confused with agricultural lime.

Pure chalk or calcium carbonate would contain 56 per cent. of lime (CaO).

Pure water-slaked lime or calcium hydrate would contain 75.7 per cent. of lime (CaO).

Pure burnt lime (CaO) would contain 100 per cent. of lime (CaO).

However, these percentages are unattainable economically for use in agriculture and are quoted solely for the purpose of comparision.

It will be observed in the list of brands of agricultural lime registered for the current year, and which is included in this article, that the percentage figures for the calcium carbonate equivalent in most cases exceeds 100, but this often is misleading.

The guarantee of equivalent percentages is made compulsory under the Act for the purpose of drawing attention to the fact that one ton of average agricultural lime in the burnt form is equal to approximately 1¾ tons of average ground limestone or chalk and 1¼ tons of average agricultural slaked lime.

The number of brands which have been registered under Section 12 of the Agricultural Lime Act for the 1941 season is sixteen, comprising four in the agricultural ground burnt section, six of agricultural slaked, and the same number of ground limestone or chalk.

Comparative figures for the brands registered in each section for 1940 and 1941 are given at the foot of this page.

The figures for 1941 show little alteration from those of the previous year. The average cost of lime in the slaked condition shows a decrease of approximately 6 per cent. while that in the carbonate form has increased a little more than 4 per cent. The latter is due to an increase of five shillings per ton in the price of one brand, which is equal to 18 per cent. The increase follows one of ten per cent. in the previous year.

Purchasers are now paying 7.63 pence for each one per cent. of lime per ton of this brand, whereas the average price of each one per cent. of all brands in this section is 6.46 pence and a brand of very similar quality (see list) can be obtained at a cost of six pence for each one per cent. of lime per ton.

Buyers of agricultural lime are advised to peruse carefully the guarantees associated with the brands of agricultural lime which are registered annually and to purchase (*a*) a brand of lime appearing in the registrations and (*b*) the brand which provides lime (CaO) at the lowest cost in the section.

Regarding the form of lime to buy this will depend largely upon requirements. Generally speaking, agricultural lime is purchased by the farmer (*a*) to correct soil acidity, (*b*) to improve the physical condition of the soil or (*c*) to make good a lime deficiency (real or assumed) in the soil.

Excessive soil acidity may be corrected by applying any form of agricultural lime in sufficient quantity. As lime quickly works out of the soil the correction cannot be regarded as permanent, and therefore periodic dressings of lime are necessary.

Lime in the burnt or hydrated form is the most suitable for improving the physical condition of heavy soils, although both the carbonate (and sulphate) are useful in this respect.

The popular belief that soils are deficient in lime from the stand-point of the supply of lime as a plant food may be dismissed, because the lime content of any ordinary soil can be regarded as more than sufficient for the requirements of the common crop. Furthermore, the annual addition to the soil of lime compounds contained in fertilisers such as superphosphate, blood and bone, and bonedust, is a further source of supply for this purpose. However, many soils respond to applications of lime, and in this respect it is important to realise the part played in the nitrogen cycle by the myriads of micro-organisms which exist in the soil and whose function it is to collect nitrogen from the air, and convert it into an available condition—available because the plant can make immediate use of it to build up the proteins of the vegetable body.

Leguminous plants are lime-lovers and the work of the bacteria in the root nodules, i.e., to extract the nitrogen from the air to enrich the soil with this commodity, will depend upon the vitality of the plant, and this has for one of its essentials the presence of ample lime in the soil.

On the other hand, the decomposition of organic matter in the soil such as when a green crop is ploughed under or a dressing of farmyard manure is applied, is considerably hastened by a dressing of agricultural lime which acts as a stimulant to the added bacteria so that they thrive, with consequent benefit to the soil. In this way the poorest soil can be made comparatively rich in nitrogen, but lime is essential for this purpose.

Certain phosphates, particularly those of iron and aluminium, which occur in soils are too insoluble to be of much use to the growing

Description of Lime.	Year.	Average Percentage of Lime (CaO).	Average Percentage of Fine Material.	Average Price per Ton.	Average Cost of One per cent. of Lime per Ton.
		%	%	*s. d.*	pence
Agricultural Ground Burnt	1940	82.87	63.75	60 0	8.7
	1941	82.87	65.00	60 0	8.7
Agricultural Slaked	1940	61.00	75.50	47 11	9.4
	1941	59.40	78.30	43 11	8.86
Ground Limestone or Chalk	1940	48.90	79.30	26 4	6.46
	1941	48.30	83.80	27 1	6.73

crop or grass, but lime phosphates are more soluble and therefore more readily available.

With ample reserves of lime in the soil, as such or in the hydrate or carbonate form, the reversion of water soluble phosphoric acid which follows an application of superphosphate is not nearly so drastic as in the case of a soil poor in lime. Consequently, the reverted lime phosphate is still available whereas the "super." applied to the lime-poor soil is quickly reverted to the insoluble and unavailable phosphates of iron and aluminium.

LIST OF AGRICULTURAL LIMES REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE AGRICULTURAL LIME ACT 1934 (No. 4271) FOR THE YEAR 1941.

General Description.	Brand.	Calcium Oxide.	In the Form of—	Equivalent to Calcium Carbonate.	Magnesium Oxide.	In the Form of—	Degree of Fineness. Material Passing Through a 20-mesh Sieve.	Price per Ton in 11-ton Lots.	Manufacturer.
		%		%	%		%	£ s. d.	
Agricultural Lime— Ground Burnt (unslaked)	Lilydale, No. 1	87·70	Mainly oxide	156·90	5·00	Mainly oxide	65·00	3 5 0	David Mitchell Estate, Oliver's-lane, Melbourne, C.1
,, ,, ,,	,, No. 2	80·00	,,	143·00	5·00	,,	50·00	2 15 0	David Mitchell Estate, Oliver's-lane, Melbourne, C.1
,, ,, ,,	Kurdeez ..	80·00	,,	142·85	1·52	,,	55·00	3 0 0	Victorian Agricultural Lime Ltd., 422 Collins-street, Melbourne, C.1
,, ,, ,,	Kawa ..	83·80	,,	149·70	1·20	,,	90·00	3 0 0	P. Alkemade and Sons, 535 Little Lonsdale-street, Melbourne
Agricultural Slaked Lime	Lilydale ..	60·00	Hydroxide and carbonate	107·23	3·00	Mainly hydrate	80·00	2 0 0	David Mitchell Estate, Oliver's-lane, Melbourne, C.1
,, ,, ,,	Cave Hill ..	50·00	,,	89·50	5·00	,,	72·00	1 10 0	David Mitchell Estate, Oliver's-lane, Melbourne, C.1
,, ,, ,,	White Rock ..	60·00	,,	107·00	2·00	,,	72·00	2 5 0	White Rock Lime Co. Pty. Ltd., 19 Queen-street, Melbourne
,, ,, ,,	Snowflake ..	60·00	,,	107·10	1·80	,,	75·00	2 5 0	Evans Bros. Pty. Ltd., Yarra Bank-road, South Melbourne
,, ,, ,,	Bulldog ..	51·80	,,	92·40	·80	,,	60·00	2 5 0	Bulldog Lime Co. Pty. Ltd., 344 Swan-street, Richmond, E.1
,, ,, ,,	Kawa ..	66·70	,,	119·10	1·20	,,	90·00	2 10 0	P. Alkemade and Sons, 535 Little Lonsdale-street, Melbourne
Ground Limestone or Chalk	Lilydale ..	50·00	Carbonate	89·50	3·00	Carbonate	95·00	1 5 0	David Mitchell Estate, Oliver's-lane, Melbourne, C.1
,, ,, ,,	Applim ..	51·10	,,	91·20	1·20	,,	98·00	1 12 6	Ammonia Products Pty. Ltd., 360 Collins-street, Melbourne
,, ,, ,,	Walker's ..	44·80	,,	80·00	·60	,,	75·00	1 5 0	David Walker, Waverley Lime Works, Lara
,, ,, ,,	Lara ..	45·00	,,	80·00	1·50	,,	80·00	1 10 0	Lara Fertiliser and Lime Co., Lara
,, ,, ,,	Kurdeez No. 1	47·60	,,	85·00	1·00	,,	80·00	1 5 0	Victorian Agricultural Lime Ltd., 422 Collins-street, Melbourne
,, ,, ,,	Kawa ..	51·40	,,	91·70	1·20	,,	75·00	1 5 0	P. Alkemade and Sons, 535 Little Lonsdale-street, Melbourne

Melbourne, 5th December, 1940.

W. R. JEWELL, M.Sc.,
Chemist for Agriculture.

Pasture Plants of Victoria

The Rye Grasses (Genus Lolium)

By W. D. Andrew, M.Agr.Sc., Assistant Agrostologist.

This is the first of a series of articles to be presented in simple form to enable members of Young Farmers' Clubs and others to obtain an elementary knowledge of the pasture plants of Victoria.

SOME of the most important pasture plants in Victoria belong to the rye grass group or "genus." Perennial and Wimmera rye grass are the two species used most extensively, while Italian rye grass is sown on a limited area. Rigid rye grass and "Drake" or "Darnel" are species of very little value which are not cultivated but occur naturally in a number of places.

Perennial Rye Grass (Lolium perenne L.)

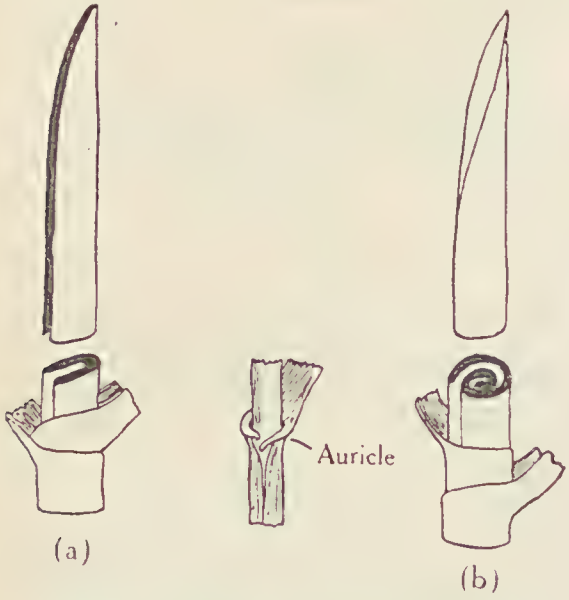
Perennial rye grass, which is indigenous to the temperate parts of Europe and Asia was recorded as naturalised in Victoria before 1878 and now is found in practically all improved permanent pastures where the annual rainfall exceeds 25 inches. It produces a large bulk of nutritious leafy herbage if conditions are favourable during its growing season, which in Victoria is approximately from March to the end of November, unless prolonged artificially by irrigation or late rains.

In a normal year, perennial rye grass makes fair growth during April and May, but its productivity declines when the ground becomes cold during the winter months. In September and October it makes its most vigorous growth, and after producing flowering heads the plants go into a semi-dormant condition until the following autumn.

Perennial rye grass tillers well and produces a low dense growth which is capable of withstanding heavy treading by cattle better than many other pasture species and consequently it appears to thrive under such conditions. It makes its best development on moist fertile soils where it can maintain itself permanently, but on loose dry soils perennial rye grass does not persist.

On many farms this grass develops naturally from a few odd scattered plants if a good sole of clover is encouraged by regular top-dressing. If a quick establishment is desired, autumn sowing on a well prepared seed bed is the usual method of procedure, although

Perennial Rye grass (Lolium perenne, L.) Note the absence of awns on the seedhead. [After *Breakwell.*



Types of emerging leaves in rye grasses: (a) folded in bud—typical of perennial rye grass; (b) rolled in bud—typical of annual and intermediate types of rye grass.

[From *Percival's Agricultural Botany.*

spring sowing is sometimes carried out in late districts. A lightly seeded cereal crop is often sown as a cover crop to offset the cost of the pasture seed.

In the southern districts, the rye grass seed can be sown on the surface or at a very shallow depth, and then lightly harrowed, but north of the divide, where the rainfall is generally lower, and evaporation higher, it is desirable to sow deeper, and the seed can be put down one-half to three-quarters of an inch with good results.

Some years ago it was not unusual for perennial rye grass seed to be sown at the rate of a bushel to a bushel and a half per acre, but it is now recognized that seedings as low as 4 to 6 lb. per acre are quite satisfactory if conditions are favourable.

A paddock consisting wholly of perennial rye grass is generally not desirable, as in the absence of clover, the grass becomes yellowish and unproductive during the winter due to lack of soil nitrogen.

At most times of the year, with the exception of the early spring, rye grass can be grazed fairly heavily, without causing much permanent injury to the plants, but consistent heavy defoliation reduces the size of the root system, and ultimately the productiveness of the stand.

Characteristic Features.

In common with most grasses it has at the junction of the leaf and stem a small transparent membrane (ligule), which in perennial rye grass is short and blunt. At either side of the ligule there are two short pointed structures (auricles) which clasp the stem like small arms, and the presence of these distinguishes the rye grasses from a number of others. The tips of the young emerging leaves are flattened and folded, whereas in some of the other species of rye grass they are rolled.

Flowers (florets) are greenish and are borne in clusters (spikelets) of 8 to 10 on the main flower stalk (rachis), the complete head being known as a "spike."

The spikelets are edge on to the rachis, and this distinguishes the rye grass species from the wheat grasses (*Genus Agropyrum*) which produce a similar head but have the spikelets arranged with their flat sides to the rachis.

If a spikelet of perennial rye grass is closely examined it will be seen that the florets are

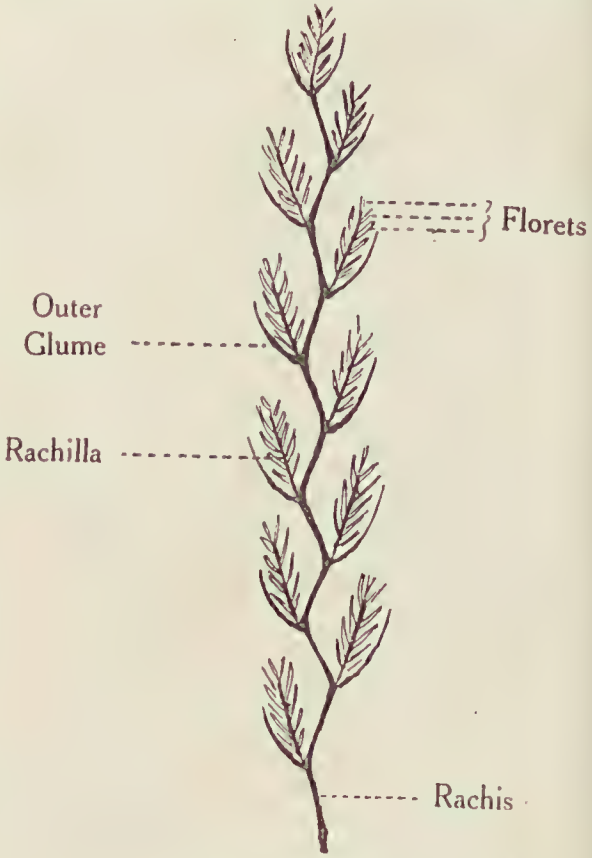
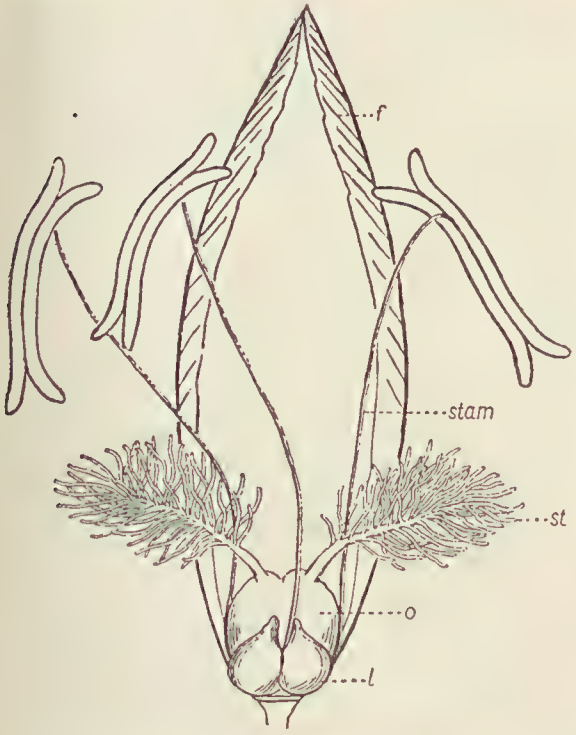


Diagram of a spike of perennial rye grass showing various parts.



Flower of perennial rye grass enlarged showing ovary (o) with its leathery stigmas (st.), stamens (stam.), with their anthers and the two lodicules (l.) The outer pale has been removed. [After *Armstrong, British Grasses.*

shielded on the outer side by a narrow pointed structure (glume), which is shorter than the spikelet.

Many grasses have two of these glumes to each spikelet, but the rye grasses usually have only an outer glume, excepting the spikelet at the top, which has two.

Each floret is simple in structure, consisting of two "flowering glumes" or "pales" enclosing an "ovary" and three filaments bearing "anthers" or pollen sacks.

When the plants are in full flower the flowering glumes gape open and the anthers hang out and discharge their pollen. The movement of the heads waving in the wind scatters the pollen grains which become dusted on to the receptive tip of the ovary (stigmas) of the same or another floret, thus bringing about fertilization.

After this has taken place the ovule at the base of the stigma develops into a seed which is correctly termed a "caryopsis". In most grasses this remains permanently encased by the flowering glumes.

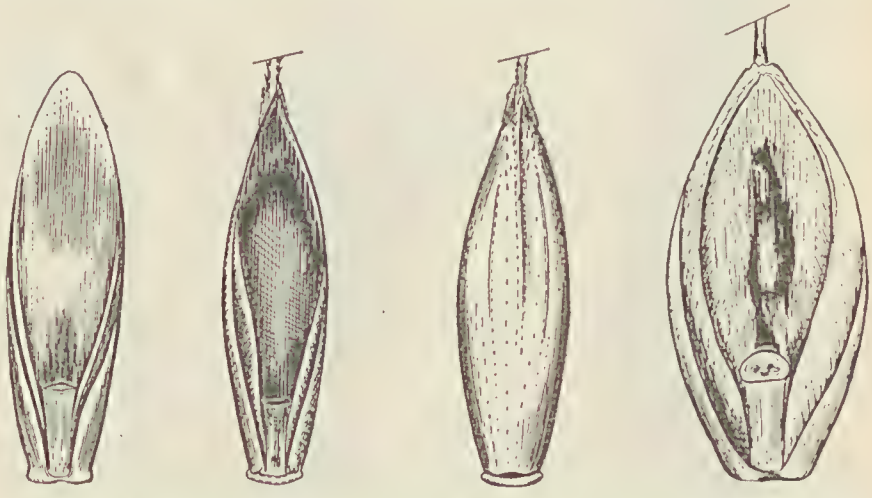
These "seeds" of perennial rye grass are barge shaped and have no awn (whisker) on the flowering glume, whereas awns occur on the seed of some of the other rye grass species.

Seed is harvested in Victoria mainly in the Western and Central districs, the main centres being at Colac, Clunes and Kyneton. The method of harvesting is to mow the grass, make it into hay and then thresh out the seed, or alternatively strip the seed from the plants in the paddock and leave the straw standing.

After harvesting, the seed must be cleaned by special machinery to separate it from extraneous matter such as chaff, straw and other seeds. Yields of 8 to 12 bushels per acre are common, a bushel weighing approximately 20 to 25 lb. One pound of seed contains approximately 237,000 seeds. Sometimes the seeds do not germinate very well which may be due to a number of causes. Two of the most common are heavy frosting when the seed is forming or infection by the fungous which causes "Blind Seed" disease.

Wimmera Rye Grass (Lolium spp.)

In 1919, Mr. H. A. Mullett, Director of Agriculture, during a visit to the Wimmera, noticed a paddock of rye grass species at



Left to right—Seed of perennial rye grass; Italian rye grass, front and rear view; and Drake or Darnel. The complete awns are not illustrated. [After *Armstrong.*

Minyip which had been growing there for 20 years. As a result of a survey the species was traced to several other places in the Wimmera. Samples were referred to the late Professor Ewart who identified it as *Lolium subulatum, Vis.* Mr. Mullett drew attention to its value as a pasture grass for the drier portions of the State. Since then its worth has become widely recognized and it is now grown in many parts of the country.

Wimmera rye grass is annual in character but on soils of loose texture readily re-establishes itself. When seeds are grown singly in experimental plots, allowing each plant adequate room for development, considerable variation in the degree of awning, number of florets per spikelet, length of the outer glume, amount of branching of the main stems and inflorescence and the degree of uprightness or laxity of the foliage may be observed but, planted in the normal manner, little variation is observable.

As a result of close study, authorities now agree that Wimmera rye grass is a hybrid between Italian and Rigid rye grass and they maintain that it is not correct to describe it as a distinct species.

It will grow over a wide climatic range but its value lies in its vigour relative to other annual species in districts where the rainfall is less than 20 inches per annum. Once established in wheat land it tends to persist and for that reason is not welcome on the better class wheat lands when wheat prices are at a satisfactory level.

The plants produce a large bulk of leafy herbage after which they send up a seeding head and die. These heads are similar to those produced by perennial rye grass but they emerge earlier. The outer glume is long and rigid, and many of the flowering glumes are awned. A characteristic of Wimmera rye grass is the distinct elbows on the stems of the plant and the manner in which the reddish coloration at the base of the stem extends upwards as the plant matures.

Emerging leaves are rolled rather than flattened, and when extended are broader than those of perennial rye grass. Yields of 10 to 15 bushels of seed per acre are common but there are fewer seeds per pound than with perennial rye grass.

Selections of Wimmera rye grass from experimental plots of the Department of Agriculture.

Italian Rye Grass (Lolium italicum, Braun).

Italian rye grass is often regarded as a cultivated biennial form of *Lolium multiflorum*, (Lam.) which is described as a strictly annual species. "Westerwolds" or "Westernwolths" rye grass is supposed to be a multiflorum type but local trials have indicated that seed on the Victorian market produces plants which do not materially differ from the ordinary Italian rye grass.

A feature of Italian rye grass is its ability to luxuriate under very wet conditions and as it makes rapid growth in the first year it is often included in seed mixtures to provide feed while the slower growing perennial species are becoming established.

The growing period of Italian rye grass is similar to that of Wimmera, but it commences flowering later in the spring. It has a broader leaf than perennial and Wimmera rye grass and the young shoots are rolled in a manner similar to those of Wimmera rye grass. Seeding heads can be readily distinguished from the other species of rye grass as the spikelets contain 10 to 20 florets which bear long awns, although it is not uncommon for these to be shed when the seeds are ripening.

A pound of seed contains about 228,000 seeds.

Italian rye grass (Lolium italicum, Braun). Note many-flowered spikelets and conspicuous awns. [After *Breakwell.*

Rigid rye grass (Lolium rigidum, Gaud). The short rigid heads are characteristic of this species. [After *Breakwell.*

Rigid Rye Grass (Lolium rigidum, Gaud.)

Rigid rye grass is an annual low growing rye grass which produces a poor yield of very stemmy growth, and on this account it is not cultivated as a fodder grass. The seeds germinate in the autumn and the plants mature early in the spring. Seeding heads are comparatively short and the spikelets are pressed closely into the rachis giving the head a thick rigid appearance.

Rigid rye grass has been mistaken by some farmers for Wimmera rye grass, and the latter has suffered in their estimate as a result. It is one of the parents of Wimmera rye grass referred to previously in this article, but is not nearly as good.

In the early stages it provides scanty feed, but later it becomes harsh and unpalatable.

The grass is widely spread in the Northern districts of the State. It may be found sometimes persisting on salty ground, and it has probably endowed its progeny, Wimmera rye grass, with its tolerance of salty conditions.

There is a grass called "Buloke Grass" (*Lepturus*), often found associated with Rigid rye grass, but it is not a Lolium.

Drake or Darnel (Lolium temulentum, L.)

Drake or Darnel rye grass is an introduced annual grass which produces leafy growth that is readily eaten by stock but the seeds can be poisonous.

Characteristic features of the seeding heads are the long outer glume which exceeds the length of the five to seven flowered spikelet and the manner in which the seeds are swollen at maturity.

There are two forms of Darnel, one having long awns on the flowering glume, the other having short awns or none at all which is sometimes known as *Lolium arvense*, (Weth.).

Drake or Darnel rye grass is the "Tare" of Scripture.

Drake or Darnel (Lolium temulentum, L.). Note the very long outer glume. [After *Breakwell.*

Packing Pears for the Local Market

The succesful marketing of pears on the local market depends on two factors—the packing and maturity of fruit.

The case used for this purpose is the flat bushel case (the long bushel opened on the side) size 26 inches long (clear of partition) 14¼ inches wide and 6 inches deep.

White lining paper cut to the correct size can be obtained and should be used; many growers use newspapers for lining and by so doing, detract from the appearance of their fruit.

Fruit should be removed from cool storage from 10 to 14 days before it is required for market to allow it to ripen. The fruit should be closely watched, and should be packed as soon as it begins to ripen at the stem end.

Two types of packs are used, both with good results. First is the pyramid pack, which is the packing of a solid layer of fruit on the bottom of the case, then packing another layer in the hollows, or over the stem end of the first layer, the third layer again being packed in the hollows. Three layers only are needed to complete the pack, presenting a solid layer of fruit for presentation to the buyer. Sizing to ¼-in. is sufficient for this type of pack.

The second method is the diamond pack, which is actually the two-one pack as used for export, but packed on the side of the case. The fruit is spaced to pack 4—4 or 4—3 packs according to size, three layers being required to fill the case.

The counts used for the export case should be followed, to successfully use this pack, as a satisfactory pack cannot be obtained unless the sizing is accurate.

It is essential that the fruit be packed strictly to grade standards—Extra Fancy, Fancy or Good.

Summer Defects of Cream

Junketty and Ropy Cream in Victoria

By R. H. N. Trembath, M.Agr.Sc., Dairy Technologist.

FROM about the beginning of December until the end of the hot summer months, suppliers to dairy factories in many parts of the State not infrequently suffer considerable inconvenience and appreciable financial loss on account of troublesome outbreaks of certain cream defects, which are bacteriological in origin and occur almost in epidemic form. Common among such cream quality troubles are those resulting in the conditions known as "ropiness" and "sweet-curdled" or "junketty."

The precise effect of these conditions in the cream upon the quality of the butter manufactured has never been experimentally determined, but experience has shown that they do give rise to certain difficulties during processing, and it is therefore correct that such cream is by definition ineligible to be accepted as "Choicest" grade. The matter is thus one of immediate concern to supplier, dairy supervisor, and factory manager alike.

The services of the Dairy Research Laboratories of the Department of Agriculture have frequently been called upon to assist in locating the cause and to suggest means of overcoming these troubles, and the present article is written in the hope that the findings which have been made and the control measures offered will prove of value to those concerned in the event of future cases of a similar nature.

"Junketty" Cream.

During the present season extensive outbreaks of "sweet-curdled" or "junketty" cream have occurred, particularly in the North-eastern and Northern areas of Victoria. The term "junketty" is a descriptive name indicating the formation of a mass of coagulated substance—curd—sometimes at or near the surface, and comprising a variable amount of the contents of the can—depending on the type and heaviness of contamination, and the age of the cream when examined. The defect is more widely known as "sweet-curdling" because, although the coagulation is somewhat similar in appearance to the curdling formed by acid-producing bacteria, no acid is developed until after coagulation has occurred, and any subsequent rise in acidity takes place comparatively slowly. If sweet-curdled milk is held for some time after the appearance of the curd, the shrinking and extrusion of a considerable amount of clear whey are accompanied or followed by peptonization or digestion of the curd. These features are not regularly observed in the defective cream received at factories, but explain the bitter taste of such cream when aged.

Occasionally, factories have complained of abnormal curd formation on the cooler, or complete blockage of the distributor tray above the cooler, and it is considered highly probable that this is caused by the development of the contaminating organisms subsequent to grading, especially in pre-heating vats. There temperatures of 85 deg. to 95 deg. F. will favour rapid growth, and in addition, the enzyme is particularly active at temperatures of 95 deg. to 110 deg. F. Small masses of curd subjected to pasteurizing temperatures will be hardened into the "rubbery" curd formation above described.

Cause of "Sweet-curdling."

The immediate cause of the coagulation is an enzyme which resembles rennin in its action, and is produced during the growth of certain types of bacteria. Rennin is the enzyme or active principle of the rennet commonly used in the manufacture of cheese.

Isolation and inoculation experiments carried out in the Dairy Research Laboratory at Werribee have afforded definite proof that sweet-curdling can be produced in milk when the appropriate cultures of bacteria are introduced and allowed to develop under favorable conditions. There are several types of micro-organisms which can be shown to cause the defect. One of these is a spore-forming bacillus, and, therefore, capable of resisting

the normal methods of sterilization in use on dairy farms. Milk produced under normal conditions almost always contains some of these rennin-producing organisms, but in such small numbers that their development is inhibited by the more numerous and more active competing types, such as the lactic acid producing streptococci. In hot weather there will always be more of the less desirable types present—firstly, because of the greater amounts of dust, dry grasses and fodders, and dried manure, which are the natural habitats of certain of these bacteria; and, secondly, because the higher temperatures prevailing are nearer the optimum for their growth. In many cases cream enters the can at a temperature above 75 deg. F., "cooled" creams of 70 deg. F. have been recorded, and a number of cans recently examined at a Northern factory were reported to have been over 90 deg. F. when received at the platform. With a heavy inoculation at the farm of the causal organism, and such ideal growth-promoting temperatures from separator spout to grading floor, it is little wonder that many creams are degraded through the development of bacterial faults such as sweet-curdling.

It is generally accepted in dairying countries that the most active type of organism responsible for the sweet-curdling defect is an aerobic spore-forming bacillus, although other non-sporing organisms have been shown to have a similar action. The original source of the sporer is described variously as dust, meadow hay, lucerne, chaff, and similar dried fodders. Samples sent to the Department's laboratories have revealed that the water supply is yet another possible source of infection of this spore-former, and at least one other type capable of coagulating milk without acid development. This water may be a secondary habitat or storage of contamination, but that does not alter the fact that it is another possible source of infection which must receive due attention in the event of an epidemic of sweet-curdling.

Combating the Defect.

The resistant nature of some of the organisms capable of causing sweet-curdling makes the prevention of contamination a difficult matter, and the fact that a water supply has been shown to be a source makes the control more so. Normally, the spore-formers do not develop readily in water, unless there is a considerable accumulation of organic matter, and definite retardation of flow. Smaller storages may be temporarily contaminated by dust from stacks of dry fodder, &c. Immediate destruction by chemical sterilizers is not altogether possible, but some good is accomplished by the elimination of the less resistant types. The following recommendations are made:—

1. All cows should be prevented from wading in stagnant pools, or feeding and walking through high dry grasses and weeds.

2. There should be an absolute minimum of dust, especially from dry fodders, around the milking shed, separator room, and cream room.

3. All sheds, bails, roof beams, uprights, and floors should be thoroughly cleansed and lime-washed as often as circumstances seem to warrant. The yards should be as free as possible from dust, and sprinkled with lime.

4. All water used at the shed and separator room should be *boiled* (not merely brought to the bubble, but held at the boiling point for twenty minutes or longer) each day until the defect is overcome, and at every recurrence. If it can be shown that the water supply is not carrying the more resistant organism, the usual chemical sterilization may be applied with advantage. Where possible, a suspected water should be replaced by rain water caught from clean roofs in suitable tanks adequately protected from dust, birds, &c., with covers.

5. Machines, buckets, and all utensils should be very thoroughly cleaned and sterilized by steaming or continued boiling. Steaming with an adequate pressure of wet steam is probably the best means of sterilizing machines and utensils.

6. Clipping the udders and flanks of the cows, and washing the udders before milking, will assist in keeping out contaminants which may have been collected while grazing or resting. The udder wash water should have been previously boiled, allowed to cool, and the normal amount of sterilizing solution added. Sterilizers depending on the liberation of chlorine should give 70 to 100 parts per million of available chlorine in the bulk udder wash water. This concentration rapidly falls when much organic matter is present, or on standing, hence it is a good plan to prepare the day's supply in bulk, and replenish smaller washing buckets as desired. [One (1) dessertspoon of sodium hypochlorite 10 per cent. solution to 2 gallons of boiled clear water.]

7. All other details involving clean milking methods must be strictly observed.

8. Flies must be eliminated.

Palliative Measures.

The above recommendations are aimed at preventing contamination of the milk and cream with those organisms which cause the sweet-curdling defect. Probably one thorough clean-up will not cure the evil—it may be a matter of days and weeks, and unless a strict watch is kept on these and all other factors of dairy sanitation, the trouble may regularly recur.

More immediate relief should be provided by the palliative measures suggested below, and here again it is emphasized that whole-hearted endeavour is needed for success, with relapse the immediate sequel to any slackening of effort. Prevention is better than cure here, as in everything else, although it is admitted that the preventive measures outlined above entail very considerable trouble. Even if there should be no great contamination with undesirable organisms at the farm, the following suggestions cannot but improve the quality of the cream:—

1. Immediate and efficient cooling of the cream to as low a temperature as possible should be insisted upon. As the defect develops at temperatures above 60 deg. F., and the rate is greatly accelerated above 65–70 deg. F., this lower temperature should be the aim. Even then, development is only retarded. The cream must be held at a low temperature right to processing; adequate protection from the sun is, of course, essential at all times.

2. Early delivery and processing would not allow the contaminating organisms time to gain the upper hand. Under the present regulated system of collection, this is not always practicable, hence "prevention" and cooling become doubly important.

Work is in progress to determine if any other means of inhibiting or slowing up the growth of the causal organisms is practicable on a large scale, and until this is complete, such remedies as the use of selected cultures are not considered safe or lasting.

The epidemic nature of the defect suggests that possibly factories inadvertently spread the trouble by inefficient can sterilization. At those factories where any supplier has sent in this kind of cream, extreme care should be taken that the washing and sterilization of all cans is as perfect as possible. The final steaming should be prolonged for at least three minutes, and every care taken against subsequent recontamination.

"Junketty Cream."—(I) Control—Pasteurised cream; (II) Pasteurised cream, inoculated with sweet-curdling organism; (III) Curd formation cream + sweet-curdling isolation + starter; (IV) Curd formation cream + sweet-curdling isolation. Isolation from Water Supply, Kiewa, Victoria.

"Sweet-curdling" in Milk.

Sweet-curdling may also occur in pasteurized milk, if sufficient rennin-producing spore-formers are present and survive the heating process, and are subsequently given the right conditions for development. At least one case of incipient sweet-curdling has been noted in pasteurized milk this season. Adequate facilities for efficient plant sterilization and refrigeration should make the appearance of the defect a very rare occurrence in milk supplied by depots direct to consumers.

"Ropy" or "Slimy" Cream.

Ropiness in milk or cream is caused by the growth of bacteria normally kept in check by small initial contamination and unfavourable conditions of growth. Slimy cream is a less obvious condition, but is more common than is actual ropiness. The bacterial defect is quite distinct from, and should never be confused with, the abnormal "stringy" condition due to pronounced mastitis. It is never perceptible in freshly drawn milk, but develops on standing. The slimy texture is due to the production of gums or mucins by certain organisms, and is frequently associated with capsule formation. In some cases the gummy substance is liberated direct into the cream;

in others, it is the solution of the capsule or the hanging together of very many capsulated organisms, which results in the abnormal texture.

Frequently slimy cream has a definite unclean taint, but this is due probably to other casein digesting micro-organisms which are also present. A pure culture isolation capable of causing pronounced ropiness in milk has been maintained here for two years, and this organism, whenever demonstrated, has produced that defect without any off flavour.

It is reasonably certain that the bacteria gain access to the milk from a channel, creek, or stagnant pool, either through the agency of the cow or the water supply. All indications point to a water-borne organism, and samples taken from stagnant water have been shown to contain bacteria capable of causing ropiness. Pastures after irrigation may also hold the organism, which is picked up by the hair round the face and feet of the cows and carried to the shed in mud. Once established in the milking shed, infection of milk and cream is easy by way of dust, improperly-cleaned machines and equipment, or udder-wash water. There is no evidence to support the belief that the milk may be contaminated by drinking the water containing the organisms. The most probable infection is by carriage externally in wet hair or mud, as suggested above.

These bacteria differ from the more common sweet-curdling type in that they are not spore-formers, and further, their growth is more suited by the comparatively low temperature range 65–75 deg. F.

Recommendations.

As already indicated, the water supply both in the paddocks and at the milking shed is the prime suspect in the case of an epidemic of ropy milk or cream. The special sanitation measures outlined in the methods for combating sweet-curdling will apply also in remedying this defect, since it also is due to bacterial action. Alternative water supply and the judicious use of a chemical sterilizer, coupled with thorough methods in the milking shed and separator room, are obvious steps to be taken. A note of warning in the use of chlorine sterilizers has already been sounded, and it is further stressed that a full knowledge of the uses and short-comings of any such sterilizer should be sought by those who are inclined to place a blind reliance on them. These solutions in no way replace detergents, as they are not fat solvents nor emulsifying agents, and therefore should never be used anywhere except on clean surfaces or in comparatively clear water. One of the main disabilities of chlorine solutions is the poor wetting power; this makes them much inferior to a penetrating sterilizing agent such as steam under pressure.

"Ropy Cream." Isolation from a stagnant pool at Cohuna, Victoria.

The provision of dry crossings and the fencing off of muddy or stagnant water-holes and similar stretches of creeks, together with care in grazing after irrigation, should be the first actions when ropy or slimy cream is reported. This should control the original source of the contamination; and other precautions adopted to ensure the elimination of any secondary source of infection nearer home.

Summary.

Both sweet-curdling and ropiness of milk and cream are due to abnormal development of contaminating bacteria favoured by seasonal conditions of temperature and habitat.

In both cases the prevention of contamination should be the first consideration, but certain difficulties, such as spore formation, make this a heavy task. Thorough sanitation and rigorous cleaning of utensils and certain precautions to be adopted in the fields and with the water supply have been outlined, and palliative measures also have been dealt with.

Live Stock Notes

Reminders for February—March

Compiled by A. C. T. Hewitt, M.Agr.Sc., Live Stock Science Officer

Food Supplies.

SUPPLEMENTARY hand-feeding usually has to be increased during the late summer when pastures commence to dry off and milk yields drop. Good rains during December and January have ended the drought by replenishing water supplies and supplying the necessary moisture for summer fodder crops and pasture. However, for the time of year hand-feeding will still be very heavy, and for the farmer who has to buy feed, a problem exists as to where and how the cheapest foodstuffs can be obtained. The urgent need for farmers to become self-supporting as far as fodder reserves are concerned is again apparent.

Stock feeds are always dear during bad seasons, and this year has been no exception. Hay, chaff, straw, and oats are firmly held, and subsequently changing hands at high prices. Bran and pollard are available at more reasonable prices, but in very limited quantities, as a result of the small amount of wheat being gristed. Feed barley is also quoted at a reasonable price in conformity with that of pollard, but it is scarce also. Abundant supplies of wheat are available at 4s. 1¾d. per bushel in truck or 50-bag lots from the Australian Wheat Board, Williamstown. In country districts where wheat is stored, it is offered by the Wheat Board at 4s. 1¾d. per bushel, less freight to Melbourne. A wheat grower may rebuy his wheat for feeding purposes from the Board at the price it was originally sold for, plus the Board's handling charges.

At £6 per 2,000 lb. f.o.r., Melbourne, pollard is one of the cheapest foods on the market for pigs, poultry, and dairy cows, but as insufficient is available to supply requirements it must be supplemented with other foods of which barley is the cheapest offering. Barley is quoted by the Australian Barley Board as follows:—Feed, English, 3s. 3d. per bushel *ex* Spencer-street, 3s. 1d. *ex* country stations; feed, Cape, 3s. 5d. *ex* Spencer-street, 3s. 3d. *ex* country stations. Barley may be ground to a meal and fed to supplement pollard. Ground wheat may be similarly fed. Oats and maize are too dear to be recommended as general foodstuffs.

The feeding value of bran frequently is overestimated. The percentage used can be considerably reduced in the rations of poultry without interfering with egg production or the health of the birds. It also can be replaced with malt coombs and brewers' grains in rations for both fowls and dairy cows. Without bran, the stock can be fed on more pollard, or a ground grain ration containing a percentage of meat meal with satisfactory results. However, limited quantities of bran are available at £6 per 2,000 lb. delivered Melbourne

or suburbs, and this is a fairly reasonable price in comparison with other fodder prices.

In comparison with their food value, the grains are cheaper than roughages, the straws being exceptionally dear. However, following the recent rains the prices of roughages are expected to recede.

The following table shows the prices of foodstuffs quoted on the 29th January, 1941, and their comparative values based on the present price of pollard—£6 per 2,000 lb.

Commodity.	Price Quoted in Daily Papers 29th January, 1941.	Value Based on Present Price of Pollard at £6 per 2,000 lb.
	per 2,000 lb.	per 2,000 lb.
	£ s. d.	£ s. d.
Pollard	6 0 0	6 0 0
Bran	6 0 0	3 16 6
	per bushel	per bushel
	s. d.	s. d.
Wheat	4 1¾	3 9
	s. d. s. d.	
Oats	3 1 to 3 5	2 2
Barley	3 1 to 3 5	3 1
	s. d. s. d.	
Maize	6 6 to 7 0	3 9
	per ton	per ton
	£ s. d. £ s. d.	£ s. d.
Oaten Hay or Chaff	4 10 0 to 6 2 6	4 1 10
Wheaten Hay or Chaff	— to 6 0 0	3 0 8
Lucerne Hay or Chaff	5 0 0 to 7 0 0	3 8 2
Oaten Straw ..	3 5 0	2 0 11
Barley Straw ..	3 5 0	2 4 10
Wheaten Straw ..	3 0 0	1 5 8

Lucerne hay has a higher protein content than the other fodders, and therefore it has an added value to that shown above. In this respect bran and pollard also have small added values. Some allowances to monetary values based on food values also must be considered to cover the cost of grinding the grain and chaffing the roughages.

The feed bill can be greatly reduced by the wider use of home-grown fodders and, at the present time, land should be prepared and forage crops sown for autumn and winter grazing.

Dairy Cattle.

In recent years, milking machines have been installed on the majority of the larger dairy farms, and now the bulk of our dairy produce is from machine-milked cows.

In capable hands the machines do the work very efficiently, and enable dairy farmers to reduce their manual labour by approximately one-third, or to increase the number of cows by the same percentage without increasing the labour.

Unless milking machines are properly and regularly cleaned and maintained in good mechanical condition, troubles, both with the quality of the milk or cream produced and with the udders of the cows, are likely to be serious. As with hand milking these troubles are usually more serious on badly-managed farms and farms conducted with disinterested labour.

Apart from thoroughly cleansing the machines after each milking, all the rubbers should be inspected regularly, and replaced as soon as they show signs of cracking, swelling, softening, or losing their resiliency. The vacuum pressure should be tested at regular intervals, as too much vacuum has been shown to induce udder troubles. The engine and pump both should be kept in good mechanical condition, and finally the machines should be removed from the cows immediately they have finishing milking.

One reason why milk yields tend to drop so rapidly at this time of year is the low protein content of the dry pasture. Supplementary feeding with meadow or oaten hay does not supply sufficient protein for normal milk production.

Increases in milk yield while cows have access to a green forage crop such as lucerne, millet, sorghum, rape, or early oats are largely due to the extra protein supplied by this type of forage. Increases also can be obtained by adding 10 per cent. of meat meal, 15 per cent. of peanut meal, or 20 per cent. of linseed or rape-seed meal to the supplementary rations.

Sheep.

To obtain some definite information about the effects of delayed slaughter on export lambs, a detailed investigation has been carried out in South Australia by the principal, Dr. A. R. Callaghan, and the sheep instructor, Mr. D. S. Thompson, of the Roseworthy Agricultural College, on lambs born during the autumn, 1939. The lambs were by Southdown rams from half-bred Dorset Horn x Merino and Border Leicester x Merino ewes. For the investigation, 165 lambs were finally selected and divided into five groups of 33 each, which were as nearly identical to one

another as was practical to obtain. The five groups were weighed and despatched to the Metropolitan and Export Abattoirs, Gepp's Cross, Adelaide, where they were confined in covered pens, and, until within six hours of slaughter, they were given access to water.

The five groups of lambs were slaughtered as follows :—

1. Six hours after removal from their dams.
2. Twenty-four hours (one day) after.
3. Forty-eight hours (two days) after.
4. Seventy-two (three days) after; and
5. Ninety-six hours (four days) after.

It is agreed generally that stock should be held without food for 24 hours before slaughter to reduce food taints, to empty the bowels, to facilitate clean dressing of the carcass, to bleed the carcass more thoroughly, &c.

Sheep feeding exhibit at a country show.

Most lambs are slaughtered somewhere between 24 and 48 hours after removal from their dams, but occasions arise, due to "gluts" and unavoidable transport, market and slaughter yard delays, when lambs may not be slaughtered until up to four days after removal from their dams.

These delays have induced much propaganda about the wastage of lambs during transit to markets and while awaiting slaughter and the need for more freezing works in the centres of fat-lamb producing districts.

However, the results of this South Australian study which have been published recently in the *Journal of Agriculture* of South Australia, disclose that the loss in hot-dressed carcass weight for lambs weighing 63¼ lb. on the farm and slaughtered after a delay of three or four days from the time they were removed from their dams was only 1.6 lb. and 1.9 lb. respectively over what it would have been had the lambs been slaughtered within the first 24 hours, and that the bloom, condition, and grade of the carcasses was in no way adversely affected.

The average live and carcass weight of the lambs, subject to the different treatments before slaughter, are shown in the following table :—

Treatment—Length of Time between Slaughter and Removal from Dams.	Number of Lambs.	Farm Live Weight.	Pre-Slaughter Live Weight.	Hot Carcass Weight.	Export Carcass Weight.
		lb.	lb.	lb.	lb.
1. 6 hours ..	33	63·38	60·99	34·85	33·27
2. 24 ,, ..	33	63·23	58·92	34·75	33·19
3. 48 ,, ...	33	63·33	58·23	34·02	32·49
4. 72 ,, ..	33	63·27	57·08	33·17	31·69
5. 96 ,, ..	33	63·24	56·16	32·88	31·40

In summarizing the results of their work, Dr. Callaghan and Mr. Thompson state that the tendency has been for producers and buyers to exaggerate the loss to the industry resulting from delayed slaughter of lambs. When slaughtering was delayed four days, a delay that is only very rarely experienced, it was found that three-quarters (actually 73 per cent.) of the loss in live weight was from the offal and only one-quarter (actually 27 per cent.) from the carcass itself. The frozen carcasses slaughtered after a delay of four days were only 1¾ lb. lighter than those slaughtered after a normal minimum delay of one day. Lambs slaughtered after delays of three and four days received as many points from the grader for bloom and condition of the carcasses as those slaughtered earlier.

Pigs.

START FEEDING THE LITTER BEFORE IT IS BORN.

Investigations have shown that pigs born with a heavy weight and good vitality have a much better chance of survival to weaning time, and make faster growth at all times than those pigs which weigh less than 2 lb. or which lack vitality at birth. Thus large individual weights, as well as large total litter weights at birth, are desirable.

The use of breeding stock whose parents' performances are known to be good and the correct feeding of breeding stock are means of obtaining large litters of virile pigs.

The feeding of pregnant sows is generally considered the easiest part of pig raising, and in many cases very little care is taken to ensure that sows are receiving a complete, balanced, and adequate diet. Even when pregnant sows appear to be in good fat condition, they still may be under-nourished in some of the essential food factors, such as vitamins, minerals, or protein, so necessary for reproduction and milk production. The old assumption that sows could be kept in any sort of condition during most of the gestation period, provided they were fed well during the last two weeks, has been upset by recent investigations in New Zealand, which showed that it was probably more important to have sows on a high plane of nutrition in the early part of the gestation period than in the later part

Maiden gilts should be in good but not excessively fat condition, and weighing about 250 lb. live weight when they are first mated. Sows which have reared a litter generally come in season a few days after the litter is weaned, and, provided they are not too low in condition, they should be mated then and fed so as to have them improving in condition throughout the gestation period until they are at their top, but still not excessively fat, at farrowing.

When pregnant sows have good pasture they will require a little milk or protein-rich concentrate such as meat-meal, and sufficient grain to produce the desired condition. When pasture is poor or is not available, other green food or good quality legume hay, chaff, or silage should be provided. In cases where grain or mill offals are being fed in large quantities, that is 3 lb. or more daily for each sow, the addition of ground limestone to the diet is recommended.—(L. A. DOWNEY, H.D.A., Pig Expert.)

Poultry.

Some of the later hatched pullets which are about to come into production, need special care and attention at this period of the year in order to prevent them from becoming lowered in constitutional vigour which is usually followed by colds or other ailments. Good housing and strict sanitary conditions are most important, especially with young stock, and a variety of good wholesome foods, together with a liberal supply of succulent green feed, is essential also. If careful consideration is given to these details, all undue loss will be avoided.

If good health of the birds is to be maintained, it should be fully realized that a continuous supply of green feed must be available, and, therefore, steps should be taken to plant sufficient quantities of the different varieties suitable for the purpose throughout the year.

A good deal of culling usually is carried out during the months of February and March, and all birds that have become unprofitable should be disposed of. During the culling operations only the best birds should be selected for breeding purposes, and they should be given special care and attention in order that they will possess the necessary health and stamina to enable them to produce strong progeny.

All cockerels should be examined for faults, such as weak combs, crooked breasts, and under development; and only the best kept for breeding purposes.—(H. F. CLINTON, Poultry Expert.)

Horses.

For many reasons it may be necessary to "blister" a horse to overcome some injury or strengthen injured tendons or joints.

The hair over the part to be "blistered" should be clipped short, and the skin then thoroughly washed with soap and warm water containing some mild disinfectant, such as lysol or dettol, at a strength of 1 per cent. The part should then be thoroughly dried.

Having tied the horse up short by pillar reins so that he is unable to get his head down to bite the treated spot, the operator rubs in the blister for five to ten minutes with the hand according to the severity of the effect required. The horse should be kept tied up tight until the irritation subsides. The part then should be gently washed with soap and

warm disinfectant solution as before, then dried and covered with a liberal dressing of boracic ointment.

The horse then should be turned out for two or three weeks, when the treatment may be repeated.

A very useful mixture to use as a blistering ointment is prepared by mixing thoroughly one part of biniodide of mercury in eight parts of lard or lanolin.—(W. D. Shew, G.M.V.C., B.V.Sc., Senior Veterinary Officer.)

Bees.

The yield of honey from red gum has been very light in the western half of the State, but a welcome supply of pollen has been secured from that source, and normal breeding is again possible Manna gum and black or swamp box should bloom during this month, providing a further supply of pollen and at least sufficient honey for breeding purposes. Strawberry clover should be in full bloom in parts of the south-western and Gippsland districts. As the secretion of nectar is light, strong colonies are necessary to secure a surplus of honey from this source. Where prospects for the autumn are uncertain care should be taken to leave sufficient honey with each colony to carry it through the winter. Conditions are now suitable for queen rearing, and no time should be lost in replacing old and unprofitable stock. Autumn-raised queens usually produce strong and vigorous colonies in the following spring.

As with other types of farming, successful bee-keeping is associated with a good sound application of knowledge gained from practical and technical experience. In the bulletin —Bee-keeping in Victoria—the apiculturists of the Department of Agriculture have outlined the whole subject of bee husbandry. The bulletin is particularly valuable, containing interesting information for all apiarists, irrespective of whether they are keeping bees as a full-time occupation, as a side line, or a hobby. The book is obtainable at a cost of 1s. 9d. posted, from the Director, Department of Agriculture, Melbourne, C.2.—(J. W. Thomlinson, Apiary Inspector.)

AGRICULTURAL LIME—*(continued from page 60).*

benefit by the application of lime. Whether such benefit would be economical or not depends largely on the degree of improvement obtained and on the price of lime; with the relatively heavy applications required, lime must be very much cheaper than at present before it could be economically applied on many large areas. Apart from soils used intensively (as in market gardening), where the necessity for lime has a special significance, most of the areas likely to be benefited by liming lie south of the Dividing Range and more particularly in Gippsland. This naturally follows because, generally speaking, the higher the rainfall the more acid the soil. Most of our northern soils and those of the Wimmera have an alkaline reaction and are amply supplied with lime. With few exceptions, little result is to be expected from liming in these areas.

It seems rather amazing that any salesman should attempt to sell lime in certain districts in which they have been active, and still more amazing that farmers in these districts should be persuaded to buy lime for their land. In some of our northern soils, where sodium predominates in the clay complex, the addition of lime is not only unnecessary, but may be actually harmful.

A few instances have been met with in which acidity was so pronounced that satisfactory growth was not obtained until after heavy liming, but it should be noted that lime will not always give an economical return even on soils which one would expect to respond to liming. Farmers who propose to use lime, therefore, are advised to try a small area first and to note the results before deciding to lime on a large scale. Experimental plots, which include trials with lime, have been established by the Department of Agriculture in a large number of centres, and farmers should look to the Department, and to experiments in their own districts or to those nearest their farms, for evidence as to whether liming is likely to be economically beneficial under their conditions.

In addition, the degree of acidity of a soil sample will be determined for farmers, together with advice as to whether liming is indicated, for a nominal fee of 2s. per sample. Samples of agricultural lime will be analysed for lime content for farmers for the same nominal fee per sample. All such samples, and any inquiries regarding lime, should be forwarded to the Chemist for Agriculture, Department of Agriculture, Melbourne, C.2.

Tubercle Free Herds

The following herds have been declared free of tuberculosis under the scheme conducted by the Department of Agriculture. Under this scheme a tuberculosis-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests, or, upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

ACCREDITED TUBERCLE FREE HERDS.

Name.	Address.	Number in Herd.	Name.	Address.	Number in Herd.
Banyule Stud Pty. Ltd.	Heidelberg	34	Longerenong Agricultural College	Dooen	46
Black, Estate, late I. S.	"The Cottage," Mount Noorat	46	Onley, W. H. ..	"Glenholme," Caldermeade	67
Black, Miss Grace ..	Mount Noorat ..	35	Payne, A. E. T. ..	"Yarra View," Lilydale	77
Dennis, Mrs. A. A. ..	Frankston	19	Payne, T. E. N. ..	"Woodburn," Kilmore	58
Dookie Agricultural College	Dookie	81	Powell, T. S. ..	"Carellen," Mansfield	41
Dunbar and Clark, Messrs.	"Hazeldean Dairy," Mount Dandenong	15	Read, Estate, late John D.	"Springhurst Estate," Springhurst	112
Gorman, A. W. ..	"Cathcart," Alexandra	80	Reid, Ralph G. ..	"Holmwood," Koowee-rup	78
Henderson, J. L. and E. I.	Wangaratta ..	95	Richardson, Bros., Messrs.	"Faldinghurst," Upper Beaconsfield	30
Holloway, R. W. ..	Caldermeade ..	57	Samuel, B. T. ..	Lang Lang ..	60
Kelly, C.	"Glenmore," Creighton's Creek, Euroa	17	School of Horticulture	Burnley	6
Lawrence, P. H. ..	"Rainga," Tarrawarra	60	State Experiment Farm	Rutherglen ..	51
			State Research Farm ..	Werribee	211

In addition to the above-mentioned herds there are 103 commercial dairy herds containing 3,282 head of cattle which may be considered free of tuberculosis. All these herds have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds, they cannot be considered as accredited under the accreditation scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

There are also 96 herds in which 4,641 head of cattle have passed one test, and may be considered therefore to be in process of becoming tuberculosis-free herds.

The Barley Crop

If it is proposed to sow the barley crop on stubble land this season, it is time farmers were giving thought to the preparation of the land. If not already under way, ploughing operations should begin at once. Delay will mean inefficient cultivation, and consequent loss of yield. Early ploughing is essential to success. Therefore, plough early and plough well.

Break up stubbles to catch the autumn rains. Cultivate thoroughly to suppress weed growth, to conserve moisture, and to allow of the development of a firm seed bed. Weed growth is disastrous to stubble sown crops. Early ploughing and efficient cultivation make early sowing possible. Early sowing means higher yields and greater returns.

Select the seed. In most districts Pryor is the most suitable variety for malting purposes, but in late districts, Plumage Archer may be grown to advantage. As a feed barley, Cape is unequalled for all districts. Choose seed from a clean crop.

If the average rainfall is above sixteen inches per annum, it will pay to manure liberally, using the super-ammonia mixtures in dressings up to two cwt. per acre. Sow early.

Remember five points:—

Early ploughing.
Efficient cultivation.
Intelligent manuring.
Suitable varieties.
Early sowing.

By A. W. Jessep, M.Agr.Sc., B.Sc., Dip. Ed., Principal, School of Horticulture, Burnley

Garden Notes.

DURING midsummer, the work in the garden is mainly that of maintenance. The hose is necessary to supply moisture, but the hoe is more important in keeping down the weeds and mulching the surface soil, to prevent the excessive loss of moisture.

The lawns should be cut regularly to keep them tidy, but not too close or they might burn during the hot summer weather. When watering the lawn, give it a good soaking to encourage the roots to penetrate more deeply. When surface sprinkling, the roots tend to remain near the surface and consequently do not withstand a dry period so well. If a new lawn is to be planted, commence cultivating the area in readiness for sowing after the first autumn rains in April.

The dahlias should be disbudded as required and faded blooms removed. Dahlias require an abundant supply of water; but if a good dressing of farmyard manure or straw is given, it helps to keep in the moisture and at the same time, a more even temperature of the soil is maintained.

This month the roses require attention, in order to secure good autumn blooms. Give a light summer pruning. This does not consist of cutting back hard as in the winter, but is more in the nature of a general clean up of the bushes. Remove all dead, sickly and very weak growths. Cut back any faded blooms or seed pods to a strong bud and usually to an outside one. Always cut at a slope of about 45 degrees to enable the water to run off. If cut straight across, the water lodges and decay is likely to develop. Give the bed a good forking over, work in market garden manure at the rate of about 3 oz. per square yard, and thoroughly water the area. Scatter the manure well over the ground to encourage the roots to grow out after it. Put on a good mulch of stable manure or any other strawy material.

Now is the time to prepare the area for the winter flowering annuals. The Iceland poppy, winter flowering sweet pea, pansy, viola and calendula are all very useful winter bloomers. They should be planted out soon after the first autumn rains to give them a chance to get well established and ready for flowering in the early winter. They are valuable for the winter flowers, but if not planted early, this essential factor is not achieved.

Narcissus should be planted in February and March for flowering in September—October. The most popular class of Narcissus with the amateur grower is the Trumpet Daffodil. It requires to be planted in well worked ground that is not too sandy. Plant about 3 inches deep and 6 inches between the bulbs. Do not allow the area to get dry between March and the flowering period, but this variety prefers a dry period during the summer months. Lift and divide the bulbs every two or three years.

There is a large number of varieties on the market and some of the good cheap ones are: King Alfred, Fuse, Goldblast, Golden City, Golden Dawn, Renown, Warwick and Yukon. They all have the yellow trumpet.

Vegetables.

Work in the vegetable garden this month is mainly a mattter of attending to the growing vegetables and the preparation of the soil for autumn sowing. It is too late to make further plantings of French beans, pumpkins, melons and tomatoes, which would not have time to reach the picking stage before the frost destroyed them. Make sowings of cabbage, cauliflower, carrots, lettuce and parsnips and have a small area ready for planting broad beans next month.

Owing to the present international situation, it is not now possible to import any culinary herbs. For flavouring, these herbs are very important, particularly with the dishes so popularly used in the Army. The Defence Department is anxious to obtain regular supplies for Army requirements, both at home and abroad. For this purpose, there is not sufficient material grown in Australia, but with a little organization, it should be possible to work up sufficient stock to supply the requirements after this year. The three essential culinary herbs are, thyme, sage and marjoram.

A free leaflet on herb cultivation may be obtained on application being made to the Director, Department of Agriculture, Melbourne, C.2.

A single plant of Thyme.

The best method of increasing the stock is by cuttings, and fortunately, these strike very easily. The seed is so fine that it has to be carefully sown and later pricked out to give the plants a chance to develop sufficiently to ensure a successful transplanting. When seed is plentiful—but that is not the case at present—it may be sown in drills in their permanent position and thinned out to the required distance apart. The plants which were taken out could be used for further plantings.

The growing of these herbs presents no great difficulties, and given an average soil and reasonable attention, two or three cuttings per year may be obtained. The plants are planted in rows about 18 inches apart and 2 feet to 2 feet 6 inches between the rows. To obtain a good sample, it should be cut just as the plants begin to flower and almost immediately carted into well ventilated drying sheds.

The drying and packing of the herbs is a more tedious job, but as it is a patriotic effort, these difficulties should be readily overcome.

If grown in small quantities, the herbs may be cut and the leaves stripped by hand. The leaves are placed in shallow trays, under cover, and turned at least once a day until thoroughly dry. They must be thoroughly dry before packing, or they will develop moulds.

If grown in larger quantities, the herbs may be cut, carted and placed not more than an inch in depth on shelves with fine mesh wire-netting. There may be several layers of these shelves about 2 feet apart. The material has to be turned, and in doing so, the leaves are more or less removed from the stalks. The sample is then sieved to remove the majority of the stems, and during the packing more stems are taken out. Although this does not produce as good a sample as the former, it does away with the monotonous hand stripping of the leaves. The wholesale commercial sample contains a certain percentage of stems, and as it is largely used in the ground state, a little stem is not a serious handicap.

Further information on the drying and packing of these herbs may be obtained from:—

Mr. Ashcroft,
Australian Defence Canteen Services,
Central Control,
52 Queen-street, Melbourne, C.1.

Methods of Propagating Thyme.

(A) Root division. (B) Rooted cutting. (C) Cutting, before rooting.

Orchard Notes

By G. W. Gayford, B.Agr.Sc., Assistant Horticultural Research Officer

DURING February, the fruitgrower will be concerned chiefly with the operations of irrigation, cultivation, spraying and harvesting. The labour shortage which is common to most districts probably will create difficulties in organising orchard work during this particularly busy month.

Fruitgrowers in northern districts who are growing both citrus and deciduous fruits are dependent on the use of irrigation water to bring their fruit to size and maturity. If water is applied in excess, the waterlogging of the subsoil has an adverse effect on the trees and the soil itself. It is during the summer that the nitrate nitrogen—that most important of plant foods—accumulates in the surface soil. The quantity of this nutrient formed depends on several factors, but the most important of these is the amount of humus present in the soil. Nitrate nitrogen is very soluble in water and heavy irrigation carries the nitrates below the root zone and in this way they are lost to the tree. It is a good idea to determine occasionally the extent of water penetration by digging inspection bores. By this means, it is possible to observe the depth to which the soil has been wetted, and so the amount of water can be regulated to best meet the tree's requirements.

Following irrigation, the customary practice is to cultivate the soil. It has been shown that the control of weeds is the most important result obtained by cultivation. The actual stirring of the soil is not in itself a means of moisture conservation. If weed growth is present, moisture losses are greatly increased. However, too frequent cultivations, particularly when the soil is wet, result in loss of structure. This means that the soil will pack down, a hardpan layer is formed and free penetration of irrigation water becomes difficult. During the summer, therefore, cultivation should be limited to a shallow tine cultivation for weed control. Weed control is even more important on non-irrigated orchards during the summer. A summer ploughing may

be advantageous here because the ground is left in a roughened condition and therefore is able to absorb any rainfall more readily. Such a treatment involves less loss of structure.

The spray advice services for the control of codling moth should enable apple and pear growers to correctly time spray applications. So far this season the pest has been well controlled but in some cases growers would be well repaid for more care in spraying methods. After spraying a group of trees, it is advisable to go back along the row and cast a critical eye over the fruit. The fruit may have received a good spray cover on the outside, but not on the inside. More spray material per tree may be required. Apples in tight bunches may not have been completely covered. Thinning of such fruit is necessary. If an inspection reveals a need for improvement it has been well worth while.

A rotary hoe for weed control in the orchard.

At this period of the year, white oil emulsion of strength one gallon to eighty may be used to replace the lead arsenate sprays. This will prevent an excessive arsenical residue on the fruit at harvest time. This spray is useful when moths are particularly active during this period. Last year, late moth activity caused considerable losses where growers could not find time to spray, and in some instances, eggs laid on fruit hatched after picking and damaged fruit in cases. A white oil spray before harvesting would have prevented this loss.

During the month, the pear varieties W.B.C., Beurre Bosc and Packham's, and the apple varieties Cleopatra, London Pippin, Jonathan and Delicious will be harvested. Pears should not be picked before the colour changes from dark to light green. Apples should be picked when there is a greenish yellow ground colour but before this turns yellow. Growers should make every effort to maintain grade standards as set down under the Commonwealth Government Apple and Pear Acquisition Scheme. Fruit will be subject to a rigorous inspection, but the success of the scheme will depend largely on growers' co-operation.

SCHOOL OF DAIRY TECHNOLOGY.—*(continued from page 54).*

requisite preliminary experience in that section. As instruction in the two sections is conducted concurrently, it is impossible for a student to qualify in both sections in two terms.

Before a certificate of competency in either butter manufacture or cheese manufacture will be awarded, the student must produce evidence that he has obtained the necessary certificates issued by the Dairy Produce Board under the Milk and Dairy Supervision Act, or hold equivalent qualifications. In the case of candidates in butter-making, the certificates required are:—

(1) Cream grader.
(2) Milk and cream tester.
(3) Butter maker.

In the case of candidates in cheese-making, the certificates required are:—

(1) Milk grader.
(2) Milk and cream tester.
(3) Cheese maker.

The fees per term are Ten guineas. A contingency fee of £2 is required as an insurance against payment for any damage of buildings, equipment, &c., for which the student is held responsible. Any balance remaining at the end of the course will be refunded.

No accommodation is provided at the State Research Farm for students, and intending students will be required to make their own arrangements in regard to board and lodging in the town, which is 1½ miles distant. The Principal will be able to advise as to suitable accommodation.

WHEAT VARIETY TRIALS

Tests at Nhill and Numurkah

MAGNET and Ghurka x C.M.G., two of the new varieties produced by the Victorian Department of Agriculture, were the outstanding wheats in last year's trials on red land in the Nhill district. For the past 21 years experiments have been conducted by the Department of Agriculture on the farm of Mr. E. W. Dahlenburg at Salisbury, near Nhill, and the results obtained have provided valuable guidance for wheatgrowers in the Wimmera.

Last season in addition to the tests on black ground, a new series of variety trials was conducted on the red sandy loam typical of a large area of soil in the "fringe" country to the north of the Nhill district. These plots were sown on May 1st and were replicated four times. Despite the dry year (the rainfall for the growing period of the crop was only 5½-inches compared with the normal 9¾-inches) very satisfactory yields were obtained, the new variety Magnet heading the list with a return of 34.5 bushels per acre. The new crossbred, Ghurka x C.M.G., was next with a yield of 31.6 bushels per acre, then followed Baldmin, 30.4; Ghurka Selection, 29.5; Bencubbin, 29.3; Dundee, 28.5; Ghurka, 27.9; Regalia, 27.0; Ranee 4H, 25.8; and Gular 24.1 bushels per acre.

Magnet and the Ghurka crossbred have shown high yielding ability on black land in tests over several years and their good performance last year on red ground is particularly gratifying.

Magnet, which was formerly known as Major x Free Gallipoli, was released by the Department last year, when it was sown on some 8,000 acres. It is a late-maturing variety and benefited appreciably by the showers late in the season. Magnet is fairly tall with a strong straw and has good harvesting features although it is not so readily threshed as Ghurka. It is also a useful wheat for hay.

Ghurka x C.M.G., during many years' intensive test at several centres, showed itself a splendid variety for the Wimmera and was

Heads of Magnet wheat which topped the list in the Wheat Variety Trials, held at Nhill, with an average yield of 34.5 bushels per acre.

approved for distribution this season. Farmers were very anxious to secure the wheat and all available supplies of seed were quickly allotted. Further stocks will be built up this year at the various seed wheat stations. Ghurka x C.M.G. is a brown wheat, with many of the good features of Ghurka. It is equal to that variety in disease resistance and flour quality, can be readily threshed and is slightly taller than Ghurka with a strong straw.

Baldmin again showed good yielding capacity despite its straw weakness and another interesting feature was the performance of the two Mallee wheats, Ghurka Selection and Bencubbin. The two latter varieties, together with the early wheat, Regalia, may prove useful in the fringe country in the northern section of the Wimmera. Tests on such soils are now in progress.

Numurkah Trials.

The wheat varieties recommended for the Numurkah district are Ghurka, Baldmin and Ranee 4H for main sowing, and Dundee for limited areas.

These recommendations are based on variety trials conducted by the Department at various centres. Last year on the farm of Messrs. W. White & Son, Invergordon, near Numurkah, forty plots, each approximately 1/20th of an acre in area, including four each of ten varieties were sown on fallowed red loam on 28th May using 75 lb. of seed and 1 cwt. of superphosphate per acre.

As was general in the northern district, the season was very unfavourable, but at Invergordon, which is some 10 miles south-east of Numurkah, more rain was received than in the northern and western parts of the district, the total for the year being 9.57 inches, while for the period May to November 5.34 inches were received. The average annual rainfall over 30 years is 16.67 inches, and for the growing period mentioned 9.57 inches.

The harvest results together with averages of the four varieties tested for 5 years are as follow:

Variety	*Av. Yield* 1940 *bus/ac.*	*Av. 5 years* 1936-40 *bus/ac.*
Ghurka ..	18.7 ..	24.7
Ghurka 595 ..	16.7 ..	—
Dundee ..	15.9 ..	23.3
Magnet ..	15.4 ..	—
Ghurka x C.M.G.	15.4 ..	—
Bencubbin ..	15.3 ..	—
Ranee 4H ..	14.9 ..	23.4
Ranee x Free Glp.	14.2 ..	—
Baldmin ..	13.0 ..	25.5
Regalia ..	12.2 ..	—

The outstanding result was the excellent yield for the season of 18.7 bushels per acre given by the standard Victorian wheat variety, Ghurka, and the comparative failure of the earlier maturing type, Baldmin. The late spring rains appear to have benefited Ghurka to a greater extent than Baldmin.

Heads of the new wheat Ghurka x C.M.G.

The average results for five years show that Baldmin has the better performance. However, this variety is somewhat brittle in its straw and must be harvested promptly if loss is to be avoided. Both these varieties are partially resistant to rust, a factor which is most important in this district which often suffers from the disease.

Ranee 4H, which is recommended principally for the eastern parts of the Northern district, and Regalia, another early variety, also suffered severely from the dry conditions in the early spring. Dundee, which suffered so severely during the rust epidemic last year, gave a moderate yield of nearly 16 bushels per acre this season, but is recommended for limited sowing only. It grows straw longer than Ghurka and is therefore better for hay purposes. Of the other varieties under test, Magnet is probably of greatest interest as it was recently released for distribution in the Wimmera where it is recommended for sowing on black soils. It has been tried during the past four years at Invergordon but has not yielded as well as any of the other varieties recommended for that district.

Improvement in Cheese Quality

Progress at Stanhope

By A. C. E. Smith, B.Agr.Sc., Cheese Expert.

THE suitability of the older settled areas of the Western District for cheese making has been recognized for many years. The cheeses from Garvoc, Allansford, Port Fairy, Cobden, and Colac have a reputation for high quality, and some of the factors responsible for this are:—Breed of cattle, more grassy pastures, a good understanding of the care of milk on the part of the dairymen, and good manufacturing technique.

In the quality of their cheese, the newer Gippsland factories are achieving success which promises even to surpass that of the Western District. The 1940 Australian Cheese Championship was won by the Longwarry factory.

Cheese factories in the Northern irrigation areas of Victoria have not been able to maintain any reasonable degree of cheese quality. This has been due to poorer milk quality (caused by a combination of poorer dairy methods, high atmospheric temperatures and the intense "feediness" of the milk produced from lucerne and irrigated pastures), and to the lack of adequate equipment in the factories.

At the Stanhope Cheese Factory, however, it has been possible to overcome these disadvantages, and this season, greatly improved cheese has been produced there, so much so that instead of being able to produce First Grade cheese only, this factory has been producing a high proportion of Choicest Grade cheese this season.

The Stanhope Dairy Co. commenced making cheese in 1921. Its production has steadily increased from 99 tons in 1921-22 to 474 tons in 1939-40. The maximum supply of milk this season was 4,000 gallons daily from 68 suppliers.

The old factory premises being unsuitable, rebuilding was carried out in 1936. The present capacity of the factory is 2 tons of cheese daily.

The equipment consists of four 1,000 gallons capacity cheese vats, 1,500 gallons per hour capacity A.P.V. heat exchanger, modern starter culture equipment, 32 H.P. fire tube boiler, temperature controlled cheese-room storage by means of a 7-ton compressor, 2,500 gallons brine tank and diffuser unit; a "Titan" separator for whey skimming, and an 8-inch bore to a depth of 80-feet for disposal of surplus whey above pig-feeding requirements. Water supply is from a main irrigation channel, the water being pumped to storage tanks at a height of 40 feet.

Improved quality of cheese at the Stanhope factory has been due to:—

1. *An improved quality milk delivery.*

Dairy supervision methods have produced here a high standard of dairy buildings and of sanitation; the insistence by the Department on the cooling of the milk immediately it has been drawn from the cows has ensured the milk the capacity of keeping sound quality and has assisted in the elimination of fodder taints by aeration. Farmers are advised to make an underground storage of water for cooling, thus ensuring a supply not merely of water, but cool water when the irrigation channels are empty, conserving the water by circulation back to the underground storage, and also maintaining a reasonably cool supply of water approximating earth temperature at a depth. The assistance given by the management in this regard has been most helpful in financing cooling installations and in giving guidance in methods.

Of particular importance is the excellent organisation of milk delivery. At a recent inspection all the milk (4,000 gallons) was in the factory yard by 9.15 a.m. This limits the deterioration of the milk due to age and rising day temperatures.

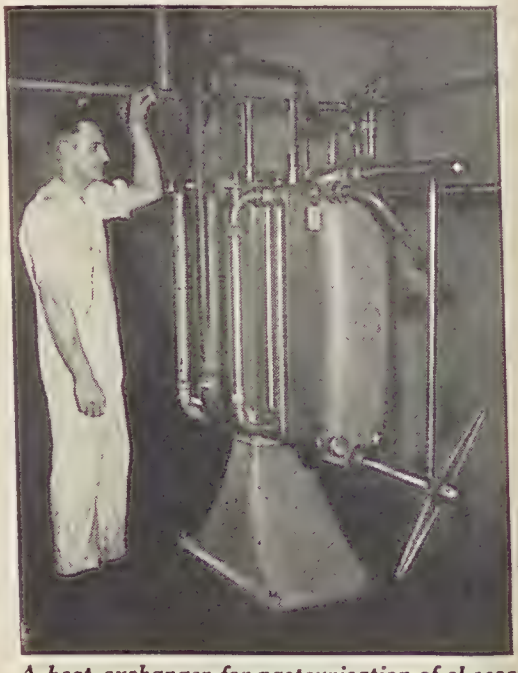
Sediment tests have revealed here an almost complete absence of gross dirt, showing the cleanliness of milking methods.

Fodder taints are now less pronounced than previously; lucerne having been replaced largely by less aromatic pasture mixtures. Some taint occurs from subterranean clover in the spring.

Only milk of choicest quality is used for cheesemaking. All other milk is separated and the cream sold for buttermaking.

2. *The installation of pastuerising equipment.*

The heat treatment of milk by the system of "flash" pasteurization, at temperatures ranging from 155°F. to 165°F., has the effect of liberating volatile fodder taints and of destroying to a fair degree the unwanted bacterial flora of the milk, and it is essential in this district, owing to the fodder taints encountered in the milk supply. Temperatures exceeding 165°F. cannot be used, since the coagulation of milk by rennet is thereby interfered with and a normal cheese cannot be produced.



A heat exchanger for pasteurisation of cheese milk.

The system of pasteurization employed at Stanhope is an extremely efficient one. It is done by means of the A.P.V. heat exchanger system. This is a regenerative system and possesses the advantages of requiring a minimum of steam for heating and of water for cooling, while the fact that a thin film of milk is being subjected on both sides to the heating medium for a period of nine seconds ensures that each particle of the milk has received the full benefit of the pasteurizing temperature for the required time.

3. *The installation of Mother Culture "Starter" equipment.*

The use of an active uncontaminated lactic acid "starter" culture is the basis of successful cheddar cheesemaking. Efficient control of starters to preserve their vitality and freedom from contamination is essential. The function of the starter in its production of lactic acid is most profound. It is responsible not only

in assisting the rennet enzyme in coagulation, in whey expulsion, and in casein degradation (which are the changes taking place in cheese-making), but also in the control of taints and the checking of undesirable fermentations.

At Stanhope, the installation of a Mother Culture starter outfit ensures that adequate control can be maintained over the cultures, resulting in greater uniformity in the rate of the manufacturing process from day to day.

The old haphazard methods of maintaining a starter were not effective in controlling taints, despite frequent renewals of the culture. With the new method, the improvement was remarkable, and the necessity for frequent renewals of the culture has been removed.

4. *An improved method of Cheddar Cheese Manufacture.*

Even with good milk and good equipment, cheese quality can be spoilt by failure to carry out the necessary operations at the right time and to the right degree. Failure to cause the expulsion of whey to the necessary degree to avoid sourness, or too fast a development of acidity, results in sour and tainted cheese. The standard method of cheddar cheese manufacture as practised in Victorian factories is designed to avoid the development of sourness while producing a sufficient degree of acidity at a suitable rate to ensure that the correct curd condition is obtained when the curd is ready to press.

5. *Controlled temperature of cheese-room storage.*

A controlled temperature cheese storage room is particularly essential in the hot northern districts. The Stanhope curing room is designed to hold the temperature at 55°F. to 60°F. By avoiding high temperatures the texture and exterior of the cheese are not spoilt by fat running and too rapid shrinkage. Flavour does not deteriorate due to the growth of organisms which prefer higher temperatures for active growth.

Despite the disadvantages of high atmospheric temperatures and fodder taints, the Stanhope district is particularly well suited for cheese manufacture. The closeness of settlement and high productivity means that the milk supply is available in a small area, thereby reducing collection costs to a minimum; while the fact that the seasonal variation in production is much less than in dry-farming districts results in manufacturing costs not being widely divergent from spring to winter.

Sub-culturing the "Mother" starter.

Mealy Bug in the Orchard

Mealy Bug attacks all types of fruit trees and vines. In Southern Victoria it is a fairly serious pest to pear growers, and in the North occasional attacks on vines are recorded. The Mealy Bug attains a size of approximately $\frac{1}{8}$ of an inch in length, and is of a greyish brown color. It is a scale insect, but retains its legs and power of movement. It reproduces by means of eggs, and, as the young crawlers feed under the rough bark, it is advisable to remove all such rough bark from affected trees or vines.

The best corrective treatment is to apply an oil spray (1 in 18) or a lime sulphur spray (1 in 10) as dormant sprays during mid-winter. This can then be followed up with white oil (1 in 60) combined with nicotine sulphate (1 in 640—1 oz. in 4 gals.) during the summer months. One good winter spraying, and two summer sprayings, usually will give effective control, even where a heavy infestation is noted.

With summer spraying, efforts should be made always to force the spray into the calyx end of the fruit.

Cultivating a Mallee fallow with the Combine.

Ultima Crop and Fallow Competition

Winter Feed for Sheep

Report of the Judge, H. L. Hore, B.Agr.Sc., Inspector of Agriculture

TWENTY-FIVE entries, comprising 17 crops and 8 fallows, were judged in the competition conducted by the Ultima Better Farming Association in 1940. The number of entries was reduced below that of past years due to the drought, which was so severe that a large proportion of the crops sown in the district did not develop sufficiently to warrant harvesting. This was particularly noticeable on the heavier soils. Crops on lighter land were, in general, better able to withstand the dry weather, and on this class of land some good exhibits were inspected.

One of the outstanding features in recent years in connexion with wheat farming in Mallee areas is the increase, both in the size of the flocks and the number of farms, on which sheep are carried. There is little doubt that the maintenance of a flock of sheep can be of material assistance in more economical production on the wheat farm. This is achieved not only by a reduction in cultivation costs due to the use of sheep as a means of assisting in the control of weeds on fallows and the utilization of feed which would otherwise have gone to waste on land left out of cultivation, but also by the sale of fat lambs and wool which may contribute a fair proportion of the income.

Because of recurring droughts and other periods of scarcity of natural feed, the provision of adequate fodder reserves becomes a necessity when stock are carried. The commonest forms of fodder reserves are grain, hay or ensilage. The increase in price of fodder which invariably coincides with a drought makes it advisable for the farmer to

accumulate during the better seasons, sufficient reserves to meet at least the needs of his own stock for several months. The financial and practical difficulties with which many farmers would have to contend in achieving this objective are realized, but these are not as serious as those which have to be met by the farmer when he is faced with the alternatives of purchasing feed at high prices or selling his stock at prices much below their normal value.

Even in a normal year in the Mallee, if the number of stock carried on the farm is at all heavy, it is frequently necessary to supplement the natural feed which develops on the land which is left out of cultivation for feed-producing purposes.

At the Mallee Research Station, at Walpeup, in recent years, attention has been given to the development and establishment of better pasture species for Mallee districts. This work has shown that there are definite possibilities for improvement in this direction. However, considering the cost of sowing, the palatability of the feed produced, and ability to recover after successive grazings, cereals can be regarded as very suitable to sow for green feed for sheep and lambs during the winter and spring months. The commonest cereals for this purpose are oats, barley, wheat or rye. Of these, oats are the most suitable as a rotation crop on a wheat farm, although on very sandy land rye will make better growth. In a good year an oat crop will recover after an early grazing and provide a supply of either grain or hay. For early green feed, an early maturing variety of oats such as Mulga, has been found most suitable, while Algerian is more suitable for green feed late in the season. Considering the feed produced throughout the whole of the season, the mid-season type Dawn has shown itself superior to either of the above types. When an oat crop is intended for grazing, it should be sown early, and much more feed is obtained if heavy rates of seeding are adopted. Seeding rates of up to 70 lb. per acre may be applied, with advantage in such cases.

The Competition Crops.

The variety Ghurka was sown on 70 per cent. of the area of the competition crops. Other varieties represented were Free Gallipoli, Regalia, Dundee and Ranee 4H. The average quantity of seed and superphosphate used was 58 lb. and 60 lb. per acre respectively. All seed was pickled with dry pickling powder.

Five entries were received in the Open Crop Competition, while in the Light Land Section there were eight entries and four for the Heavy Land Section. The two latter sections were aggregate competitions embracing the fallows in 1939 together with the crops thereon in 1940. The estimated yield of all the crops shown was eight bushels per acre.

The winning crop in the Open Section was exhibited by Mr. W. H. Nalder. The variety was Ghurka. The land had grown oats in 1938, was ploughed 4 inches deep in July, harrowed in August, combined in November and again in May and sown in July with 65 lb. of seed and 75 lb. of superphosphate per acre. It was not fed-off with sheep. This crop also gained first place in the Light Land Section.

Mr. W J. Reed, with a crop, the greater part of which was sown with Ghurka, secured second place in the Open Competition. Portions of this crop would yield exceptionally well, even heavier than that of the winning exhibit, but the average yield was reduced by thin patches. It was sown at the end of April with 55 lb. of seed and 60 lb. of superphosphate per acre. The land had been prepared by ploughing 2½ to 3 inches deep in June, then harrowed immediately. It was combined over in September, and again in October, and had no further workings until sown.

Second place in the Aggregate Competition on light land was won by Mr. A. A. Johnson.

In the Heavy Land Section crops were very light. Mr. C. G. Johnson & Son's exhibit was placed first with Mr. W. H. Nalder's entry second.

The detailed awards are as set out in the tables on the following page.

The Fallows.

The small number of fallows entered in the competition was an indication of a reduction in the area of fallowed land in the district due principally to the unfavourable conditions for breaking up the ground, and also to a desire on the part of the farmer to save as much feed as possible for stock.

Most competitors had adopted normal cultivation methods in the preparation of their fallows. Much of the light land in the Ultima district is very subject to drifting, and

on these areas some special precautions to reduce the loss of soil during the fallow period are warranted. The first step in this direction is to refrain from burning stubbles on land very liable to drift. The sowing of a cover crop on the fallow has been shown to be very effective in holding the soil, if sufficient spring rains are received to establish the cover crop.

It is considered that crops sown for the purpose of grazing, will play an important part in sand drift control. On the very light land, a crop of oats or cereal rye could be sown and grazed throughout the spring and

SECTION 1.—OPEN CROP COMPETITION—50 ACRES OF WHEAT.

Competitor.	Variety.	Yield.	Purity and Type.	Absence of—		Evenness.	Total.
				Weeds.	Disease.		
Maximum Points	.. .. ..	35	20	15	15	15	100
W. H. Nalder	Ghurka	29	19	15	14	14	91
W. J. Reed	Ghurka and Ranee 4H	29	18	14	14	13	88
E. G. Richardson	Ghurka	27	16	14	14	12	83
A. A. Johnson	Ghurka	21	18	15	14	14	82
C. G. Johnson and Son ..	Ghurka	17	18	15	14	12	76

SECTION 2.—AGGREGATE COMPETITION—LIGHT LAND SECTION.
50 ACRES OF FALLOW 1939 AND CROP THEREON 1940.

Competitor.	Variety.	Yield.	Purity and Type.	Absence of—		Evenness.	Crop Total.	Fallow Total, 1939.	Aggregate.
				Weeds.	Disease.				
Maximum Points	.. .. ..	35	20	15	15	15	100	100	200
W. H. Nalder	Ghurka	29	19	15	14	14	91	96	187
A. A. Johnson	Ghurka	21	18	15	14	14	82	93	175
W. J. Reed	Ghurka	25	18	13	14	13	83	89	172
W. H. King	Ghurka	12	18	13	13	13	69	97	166
C. G. Johnson and Son ..	Ghurka and Ranee 4H	15	18	15	13	12	73	92	165
P. W. Sloan	Regalia	12	19	15	14	12	72	90	162
D. M. McKenzie	Free Gallipoli ..	12	18	14	14	13	71	90	161
M. G. Nalder	Ghurka	6	18	15	13	13	65	96	161

SECTION 3.—AGGREGATE COMPETITION—HEAVY LAND SECTION.
50 ACRES OF FALLOW 1939 AND CROP THEREON 1940.

Competitor.	Variety.	Yield.	Purity and Type.	Absence of—		Evenness.	Crop Total.	Fallow Total, 1939.	Aggregate.
				Weeds.	Disease.				
Maximum Points	.. .. ..	35	20	15	15	15	100	100	200
C. G. Johnson and Son ..	Ghurka	17	18	15	14	12	76	91	167
W. H. Nalder	Dundee	7	18	15	14	12	66	96	162
A. A. Johnson	Free Gallipoli ..	10	18	14	13	12	67	94	161
M. G. Nalder	Ghurka	4	18	15	13	13	63	95	158

[Continued on page 96.

Pyramid Hill District Pasture Competition

Report of the Judge, A. Morgan, B.Agr.Sc.,
Irrigation Field Officer.

TO the casual observer, the best subterranean clover paddock is the one with the most feed on it, providing, of course, that it is fairly uniform and free from weeds.

Judgment of this kind, however, is not always sound, as it is necessary to have some appreciation of how the pasture is able to stand up to the strains of climate and grazing, particularly under irrigation conditions, to obtain an accurate estimate of its quality. To be able to stand up well throughout the irrigation season, a pasture needs a good framework or skeleton. It is not difficult to find parallels for this—for example, the skeleton defects of a horse, while perhaps not detectable except by careful examination, are important items which cannot be overlooked by the horse-fancier.

One might, with advantage, carry the comparison further, because although certain bone malformations are frowned on by judges and veterinarians the presence of these defects does not indicate by any means that the animal is entirely useless. Similarly, a pasture with defects in its "skeleton" may function reasonably well, and even appear perfect at times, but it does not possess the qualifications of a competition winner.

In the competition under review a case of this kind occurred, and while it would be hard to imagine a denser and more even mat of subterranean clover than that exhibited by Mr. A. Cassidy, the paddock referred to could not be placed higher than third, in view of its lack of framework.

The framework or skeleton of an irrigated pasture is made up of the channel, the drain, the arrangements made for an even and economical watering, and the fertility of the soil. Precedence is given to the facilities for watering for a number of reasons. Under northern conditions it is impossible to grow subterranean clover with continued success without irrigation; it is commonsense then to regard it as a permanent pasture and to see that it is planted under conditions where it can be irrigated year in and year out without deterioration of the pasture or the soil. In spite of heavy manuring with superphosphate the deterioration of the soil cannot be prevented if continued waterlogging is allowed—in some districts the deterioration is acute, and salt troubles develop; in others the damage is limited to a gradual increase in weeds which thrive in sour and swampy conditions.

In spite of all efforts to dispense with adequate facilities for the application of irrigation water, no method has succeeded in replacing in efficiency the system of grading and banking which is familiar under the name of the "border system." This system is one which admits of no compromise as far as the grading is concerned, although it does allow for considerable latitude in regard to the disposition of the banks. In some districts the use of very narrow bays of half a chain in width has become a fashion, almost a fad, without any underlying appreciation of the function of the banks. On a perfectly graded paddock no banks would be required as far as uniform watering is concerned, but even in this case some banks would be convenient to the irrigator for other reasons. They could be a good distance apart, however, and their disposition would be best decided from a consideration of (*a*) the average absorption of water on the particular type of soil, (*b*) the capacity of the channel supplying the paddock, and (*c*) the factor of time in irrigation.

The time factor has been mentioned last, but it is not the least important. Pastures of sown species require well-timed watering, and for the benefit of all the irrigators in a district it is desirable that the watering on any one farm should be carried out as expeditiously as possible. This is even more important in dry seasons.

For quick watering a clean main channel and subsidiaries are essential. A clean channel

indicates efficiency in the use of the water at the pasture, and is part and parcel of the exhibit. While the size of the channel should be such that it will carry a good stream of water, over-sized channels defeat the attainment of this objective by becoming choked with rushes, "cat-weed," paspalum, "nutgrass," &c., and the cleaning of huge channels is a tedious and never-ending task. A channel with a bottom width of 4 feet, if clean, will carry a good stream of water, sufficient in most cases to irrigate 30 or 40 acres a day. With weedy channels the irrigator may be forced to distribute the water from his wheel to so many paddocks that he cannot give adequate attention to them. This applies more, however, to perennial permanent pastures where paspalum has become the dominant species and has taken a firm hold in the waterways of the farms. Channels serving permanent pasture of annuals, such as subterranean clover, are usually dry for long enough in the summer to be efficiently cleaned out by grazing.

For equally good reasons the drains need to be clean to get any excess water away quickly, particularly in areas where salt-troubles are likely to develop, or are in process of being cured.

If all the irrigators had clean channels and drains the distribution of water at peak periods, such as must occur in districts where subterranean clover is being extensively grown, would be simplified, and the timing of the irrigations given to each paddock greatly improved. One frequently hears complaints that a paddock had to go a week or more too long without watering, and it is difficult to see how the best results can be achieved unless good moisture relationships are maintained as between the soil and the plant.

Factors to be kept in mind when banking a paddock have been listed, and need some explanation. The tendency to make a fetish of very narrow bays has been mentioned. The presence of sidefall or steep gradients is the real reason for the narrow bay. To a lesser extent porousness of the soil may make a narrow bay desirable, but the best regulation of over-watering at the head of the bay will be obtained by shortening the run.

No amount of banking can properly compensate for lack of grading or poor grading. If the grading cannot be brought to a reasonable standard it will pay to reduce the number and size of the banks to a minimum and to sow an annual crop, such as oats, barley, millet, ambercane, or sudan grass. When re-grading, it is advisable to wipe out these banks and grade in at least two, or preferably more, directions; then re-erect more substantial banks in permanent positions and sow with the permanent pasture, either subterranean clover, lucerne, or a mixture of perennial grasses and clovers.

In the matter of size of banks the perfection of grading attained is an important factor. With good grading large banks are unnecessary, but they should be big enough to allow for cracking after watering, heading-up of water when a good growth is on the bays, and also for the trampling by stock. A compacted low bank can be sown over with the drill or combine and will grow clover or lucerne well enough to keep down the objectionable barley grass.

Although plough and delver banks are quickly put up, and can usually be made straighter by the beginner, they are not as satisfactory in the long run as banks put up with a buckboard or buckscraper. A light board is usually kept specially for banking.

Very long runs or bays are usually possible only on the plain land, and in many paddocks they exceed 30 chains. As the greater part of the soil of this class of land *when graded* takes only about 2½ inches at a watering, and a 4-in. watering has been shown by experiment to be the most useful, the risks of over-watering at the heads of these very long bays is not great on graded land. But with the use of long, wide bays on *ungraded crab-holey land,* an attitude of carelessness in the use of water, or perhaps it would be better to say extravagance in the use of water, is fostered. On porous soils, over-watering at the head of the check can easily occur, and on Mallee and pine country runs of 5 chains are quite long enough. On some of this land, where the checks are 10 chains long, large sink-holes develop, and apart from being blemishes in a permanent paddock, they indicate that excessive additions are being made to the subsoil water and may in time cause water-logging.

Apart from these questions of water absorption, subdivision should be kept in mind as a valuable aid in increasing the production of feed from a paddock, and layout should be adapted to give convenience in regard to new

fencing or temporary fencing. On paddocks with very long runs, the new fence is better put across the bays, with a new channel and drain to make the paddocks independent in watering. Watering can then be adjusted more conveniently to avoid stocking pastures while wet. Water is also available in the channel in each paddock for the stock if required.

The foregoing remarks are only a few of the points which are worth considering as the basis of a sound skeleton for a pasture paddock—many of equal importance have not been touched on, and very little has been said about the management of the pasture after establishment. The methods adopted by the winning exhibitors should convey their lesson, although it seems that on the farm the principles of grazing management are not studied to the extent they deserve.

The Awards.

The winner of the competition was Mr. J. A. Broad. Although Mr. A. Cassidy's paddock was superior in regard to condition and uniformity, it lost points heavily in layout. Mr. L. Malone's paddock of subterranean clover showed the best layout, but had not recovered from grazing, and lost on condition. The layout of the winning pasture was not marked high, as a low portion is a bad feature of the field. No grading was done, although banks were put up at satisfactory intervals, the ground being very level in its original state.

In Mr. J. T. Leed's entry of permanent pasture, the area was less than that specified under the rules of the competition. Two types of soil occur in the paddock, and the better results obtained on the box land as compared with the plain were very apparent—points were lost for uniformity.

The above brief analysis of the list of awards indicates the factors which influenced the final decision.

Mr. Broad's paddock is four years old. It is laid out on the border system, with small banks which are practically all overgrown with the pasture. Manuring is done each year at the rate of three-quarters of a bag of superphosphate (approximately 140 lb.) per acre. Carrying capacity is indicated by the fact that in one grazing last autumn 20 acres carried 117 sheep for three weeks, and through the winter and spring eleven cows were kept in good milking and condition on 9 acres. One of these cows, "Grangelea Rose Petal," produced 4 gallons of milk a day. The previous year 23 waggon-loads of hay were carted off the 9 acres. Feed got ahead of the cows this year, in spite of the dry conditions, and subdivision was tried out with very satisfactory results. The value of subdivisional fencing becomes more apparent when topdressing and sowing down permanent pastures and lucerne becomes a regular practice on the farm. Control of stock is as important to high production as control of water, and the results obtained are sufficient answer to those who speak slightingly of the "pocket-handkerchief farming" on the better-developed irrigated properties. At Cohuna there are men with high-production herds of 40 or more cows who have successively reduced their paddocks until many are now only 2½ or 3 acres, and still they see feed being wasted in the spring and summer. Even if subdivision is only temporary, or an electric fence is used, the ability to conserve the excess either as a standing crop or as hay is a big asset in a dry year.

Mr. Broad, last autumn, sowed another 40 acres of subterranean clover with oats, but as the irrigation season had ended and the rainfall was poor the venture was a failure. He has not been discouraged, however, and intends to continue with his programme.

It is to be hoped that the increase in seed prices for next autumn sowings does not check progress in the district. Even if subterranean clover rises to 3s. per lb. it will still be cheap for the larger irrigated properties.

Second place is shared between Mr. L. Malone and Mr. R. H. Mills. Mr. Malone's subterranean clover is about eight years' old, and was sown with 3 lb. subterranean clover and 8 lb. Wimmera rye grass per acre. It has been topdressed each season with a bag of superphosphate per acre. Three waterings had been given, and about three weeks before judging it was fed off with 500 ewes and lambs for six days. Originally, saffron thistles were very bad, but they now have been crowded out by the subterranean clover. It was a welcome sight to see the dust rising from a paddock nearby, where grading was in full swing. In the competition paddock the bays are about 18 yards wide, and the banks were put up with the delver. The soil is good, fronting the Bullock Creek. Some imperfections in grading have been countered by drainage gutters along the banks. The run was short, and the channel, originally delvered out, is cleaned out every second year.

The advisibility of cutting down runs of over 30 chains in Mr. R. H. Mills' paddock of subterranean clover was debated at length. A competition piece, including a section of channel, was chosen from a 50-acre paddock which was originally, in the words of the owner, "a mass of saffrons," but which brought 466 lambs up to marketable condition and weight last spring.

Whether it is permissible to award a prize in connexion with this competion is for the district agricultural society to determine, in view of one of the entries not being acceptable in regard to area.

PASTURE COMPETITION AWARDS, PYRAMID DISTRICT, 1940.

Exhibitor.	Lay-out, Channel, &c.	Mixture.	Condition.	Uniformity.	Freedom from Weeds.	Total.
	(10)	(10)	(10)	(10)	(10)	(50)
J. A. Broad ..	8	9	8½	8½	9	43
L. Malone	9	9	6½	8	9	41½
R. H. Mills ..	7½	9	8½	8	8½	41½
A. Cassidy ..	5	9	9½	9½	8	41
J. T. Leed* ..	8	9½	7	7	8	39½

* Permanent pasture. Area less than specified in conditions of competition.

ULTIMA CROP AND FALLOW COMPETITION— *continued from page 92.*

summer, then worked up after late summer or early autumn rains in readiness to sow to wheat. A somewhat similar procedure to this was carried out by two competitors in preparing their fallow exhibits. They had both sown cereals for grazing on wheaten stubble land, and after feeding the crop off, had scarified the area in August, and worked it again in November. Unfortunately, from the point of view of drift control the second working had left the soil very fine, and in a condition to drift readily. A mouldboard ploughing without further working would probably have given a more satisfactory surface tilth.

Mr. Hamilton's winning fallow was on land winter fallowed in 1939, then combined over in May, 1940, in readiness for sowing. Owing to the dry weather, the paddock was not sown, and any weeds which appeared, were kept under control by sheep. Despite the long fallow period, the surface tilth was in good order, and no drifting had taken place.

Mr. Sloan's fallow was prepared by mouldboard ploughing 3½ to 4 inches deep in August and scarifying in November.

Mr. G. Bailey's exhibit in the Light Land section was on self sown wheat land which had been ploughed early in July, but had received no further working. It was heavily sheeped.

Mr. W. H. Nalder was one of the competitors who had sown the land to oats, then, after feeding off the crop, had worked the land over with a scarifier in August, and cultivated again in November.

The detailed awards for the Fallows are as follow:—

AGGREGATE COMPETITION FOR FALLOWS 1940 AND CROP GROWN THEREON 1941.

SECTION 4.—HEAVY LAND—50 ACRES.

Competitor.	Moisture.	Mulch.	Absence of Weeds.	Cultivation and Seed-bed.	Total.
Maximum Points	25	25	25	25	100
M. Hamilton	18	23	24	23	88
P. W. Sloan	18	22	24	23	87
D. McKenzie	18	22	24	23	87
A. A. Johnson	18	21	25	22	86

SECTION 5.—LIGHT LAND—50 ACRES.

Competitor.	Moisture.	Mulch.	Absence of Weeds.	Cultivation and Seed-bed.	Total.
Maximum Points	25	25	25	25	100
G. Bailey	19	22	24	22	87
W. H. Nalder	20	20	25	22	87
H. Gowty	20	20	25	21	86
W. H. King	19	21	23	22	85

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Issued by direction of the Hon. E. J. Hogan, M.L.A., Minister of Agriculture.

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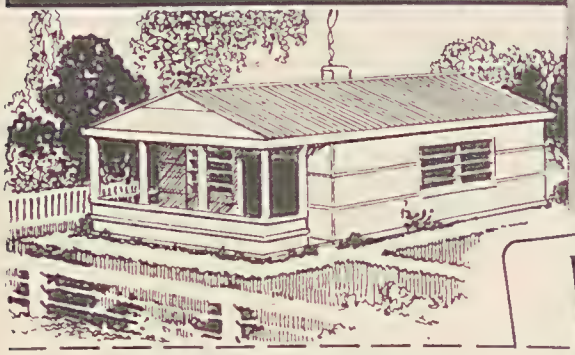

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The Journal of the DEPARTMENT of AGRICULTURE of VICTORIA

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INLAND KILLING

Facilities at Bendigo

AT a conference held on 13th February, at Bendigo, with representatives of the City Council, the Vigilance Committee, Master Butchers' Association, and other bodies, the Minister of Agriculture (Mr. E. J. Hogan) outlined the proposals of the State Government for the establishment of an inland killing centre at Bendigo. He stated that Cabinet had approved of the Amalgamated Freezing Company asking the Bendigo City Council to close the Bendigo abattoirs; the Amalgamated Freezing Company to erect at its works modern facilities for the operation of an abattoir business, including equipment for slaughtering cattle and pigs, and chilling meat for the local trade, and for a wholesale meat supply to Melbourne.

Mr. Hogan said that consumers in country districts should have their food prepared and kept under as good hygienic conditions as the people of the metropolis. The problem was aggravated in the north of Victoria, where the summers were long and hot. The conditions under which stock were slaughtered and handled in Bendigo and the surrounding districts should be improved. Abattoirs in the north of Victoria not equipped with facilities for chilling meat immediately after the stock are killed, and for holding it in a chilled condition were unsatisfactory, and if the proposal were not adopted the Bendigo City Council would have to modernize its abattoirs and provide chilling chambers at considerable cost.

Within a mile of the Bendigo abattoirs a large, well-equipped export meat works, with extensive refrigeration plant, controlled by the Government, is standing idle. It had operated only during the export season, and in some seasons it had not operated at all. The Government desired to decentralize this industry, and operate the Bendigo Freezing Works every year, and to give those desiring to export meat facilities to do so through the Bendigo Freezing Works. Until the Amalgamated Freezing Company's works at Bendigo are placed in the same position as the other proprietary meat export works, it is impossible to operate the works all the year.

The Amalgamated Freezing Company obtained the services of Mr. McDonald, meat works constructional engineer who designed the Homebush abattoirs in Sydney, and the Brisbane and Newcastle abattoirs. He reported that, because of the existing facilities at the freezing works, the cost of the additional work at the Amalgamated Freezing Company's works would be considerably less than if the Bendigo City Council reconstructed its abattoirs.

It had been stated that the adoption of the project would mean an increase in the cost of meat for local consumption, but this was inaccurate. The scale of charges which the Amalgamated Freezing Company had submitted to the Council for meat ex chiller in the case of mutton, lamb, and pigs was very little different from the present charges at the Bendigo abattoirs, but there was an increase,

in regard to beef, of one-eighth of a penny per lb. This small increase would be offset by a reduction of waste in butchers' shops, due to the meat being chilled before delivery to the butchers.

Mr. Hogan said he knew the Bendigo City Council advocated decentralization. This proposal was a step in that direction. When the Bendigo City Council agreed to the project the company would start erecting the additional works.

The Director of Agriculture (Mr. Mullett) also addressed the meeting, and stated that there was only one way in which the freezing works at Bendigo could be operated continuously, and that was by the adoption of the proposal submitted to the council. It was impracticable to have abattoirs with chilling facilities in every small town throughout the north. The only reasonable way in which these facilities could be financed and made economic was for a city such as Bendigo to be the centre where facilities were provided, and from where chilled meat could be moved freely to adjoining places. The proposal in brief was that the local abattoirs should be closed, and that in compensation, the Amalgamated Freezing Company would agree to pay to the council £500 per annum for three years. The Amalgamated Freezing Company would erect, at its Bendigo works, chilling facilities for all meat slaughtered for Bendigo and surrounding districts, and in addition, slaughtering facilities would be provided for cattle, pigs, and calves. The freezing works would be brought into line with the most modern requirements of all country abattoirs.

Councillors showed a keen interest in the project, as was evidenced by the numerous questions asked. The whole matter will be discussed and a decision reached at the next meeting of the Bendigo City Council.

Eye Cancer in Cattle

Epithelioma, a form of cancer, is a growth that usually starts in the *Membrana Nictitans* or third eyelid, a movable membrane situated at the inner corner of the eye. It appears first as a small pink nodule and gradually increases in size till the whole membrane is involved and then, unless removed, may spread into the surrounding tissue, attacking the eyelids and even the eye itself. Later the bone may be attacked and the animal will have to be destroyed. In its early stages, the growth resembles a piece of cauliflower, but is pink in colour instead of white. Very often there has been a previous injury to the eye, and in other cases irritation by flies or sand may be a factor. The cattle most commonly affected are Herefords or Ayrshires which have the eye surrounded by white hair. Where the eye is surrounded by dark hair, as in certain strains of Herefords and also other breeds of cattle, the complaint is not so prevalent.

Treatment consists of removal of the membrane at the earliest possible moment, and if the growth is small this treatment is likely to effect a complete cure. The eye should be deadened with cocaine, and the membrane drawn outwards with a pair of surgical forceps, a fish hook, or by inserting a stitch through it, when it can easily be cut off with a razor blade. The only after treatment required is to wash off the blood with a solution of boracic acid. If the growth has attacked the eyeball, complete removal of the eye will be necessary, as every portion of the growth must be completely removed.

Mange or Scabies of Pigs

By E. MURRAY PULLAR, M.V.Sc.,
Veterinary Research Institute,
Melbourne University

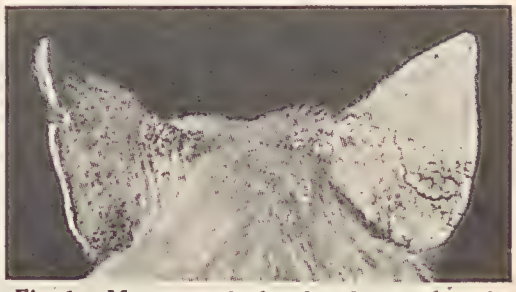


Fig. 1.—Mange on the head and ears of a pig. The normal pink healthy skin is covered with a thick layer of yellowish brown scabs.

MANGE in its severe form is probably well known and readily recognized by any pig breeder. The affected skin is rough and thickened, the hair matted and usually broken off short, and the surface of the skin is covered with a well-defined layer of yellowish or brown scabs (Figs. 1 and 2). The parts particularly affected are the butt of the tail and the adjacent part of the back, the head (ears and snout), and feet. Although the disease may become established anywhere on the skin, in very young animals the whole of the skin may be affected, and in such cases the condition is often fatal.

It is not generally realized that mange in a mild form is not uncommon, particularly in older pigs. In these cases the skin appears dry and harsh, with very little hair, and scab formation is not marked. The lesions may be confined to the butt and tip of the tail, and the edges of the ears. It is not clear why these mild cases do not progress further, but it is considered that the natural resistance of the more mature animals, combined with the custom of applying oil to the skin to control lice, keeps the parasites in check to some extent. These lightly affected pigs are a menace to the herd because they act as a source of infection for the clean stock. Litters raised by infected sows usually begin to exhibit evidence of infection at or about weaning time, when resistance to infection appears to be at its lowest.

Fig. 2.—Mange on tail of a pig. All the hair has fallen out and the skin is covered with thick yellowish brown scabs. The mange is spreading up the middle of the back also.

Cause of the Disease.

Mange results from the infestation of the skin by a small spider-like creature known as a mite. When fully grown this parasite is about one-hundredth of an inch long, just too small to be seen with the naked eye.

The body of the mite (Fig. 3) is rounded and flattened, like a lentil. There are four pairs of legs, two pairs being attached close together, well forward on the under surface of the body, and projecting forwards and outwards; the other two pairs of legs being attached behind the middle of the body and projecting backwards and outwards. In general, the legs are very short and stumpy. In fact the second last pair of legs are so short that they only just reach the edge of the body. At the tip of each leg there is either a bell-shaped suction cup on a short stalk, or a long hair-like bristle. Both are used to grip the skin while walking.

The mite has no eyes, and it is provided with several rasp and pincer-like structures (mouth parts) with which it tears the skin. It feeds on the torn fragments and the tissue juices which exude from the broken surface.

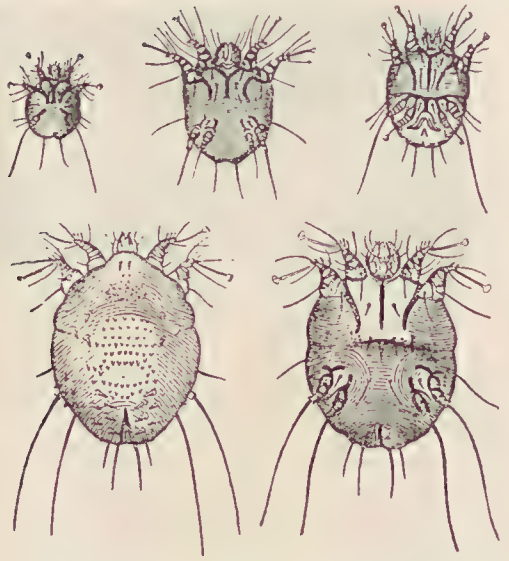


Fig. 3.—Mange mites in various stages of development. Top, left to right: larva, nymph, adult male (all seen from under surface). Lower: adult females (upper surface left, under surface, right).

Life Cycle.

The mites, males and unfertilized females, live under the scabs on the skin. After fertilization by the males, the females commence to tunnel or burrow into the skin. In these tunnels they lay their eggs. Compared with the size of the mite the eggs are very large, being about half as long as the body of the female (Fig. 4).

In the dark, warm, and moist surroundings of the tunnel the eggs develop and hatch in about four days. The baby mite which emerges from the egg is known as a *larva.* In appearance it differs from the older mites in that it has only three pairs of legs. The larva crawls out on to the skin where it hides under the scabs and feeds on fragments torn from the skin, and pus and fluid which exudes from the broken surface.

The baby mite or larva grows all the time. As its skin is hard and will not stretch, it eventually reaches a stage when it can grow no further. Then, like a crab or any other hard-shelled insect, it must cast its outer coat and grow a new one; this is called moulting.

The new form, which emerges from the shell of the larva, is known as a *nymph,* and is provided with eight legs. The nymph, which lives and feeds like the larva, in turn stops growing after a few days, and passes into a resting stage and then moults. From the cast skin of the nymph the fully-developed male or female mite emerges. The mites mate on the surface of the skin, and the fertilized females begin to prepare fresh tunnels. Thus the life cycle is completed.

Each female mite lays from 10 to 25 eggs. These hatch in 3 to 4 days, and the mites pass through the several stages in their development and become mature and start laying eggs in from 10 to 12 days. The complete life cycle takes about fifteen days.

It has been estimated that a single pair of mites could, in six generations (i.e., two to three months) produce 1,500,000 descendants.

Harm done by the Parasites.

The mites exert their harmful effect in three ways:—

1. *Injury to the Skin.*

Mangy pigs are less attractive to the buyers for two reasons. First because the injured, scabby skin spoils the appearance of the pigs and, secondly, when the carcasses are dressed and the scabs removed in the process of scraping, the underlying skin looks red, angry, and raw. Badly affected animals have to be skinned and used as choppers, and so bring a lower financial return.

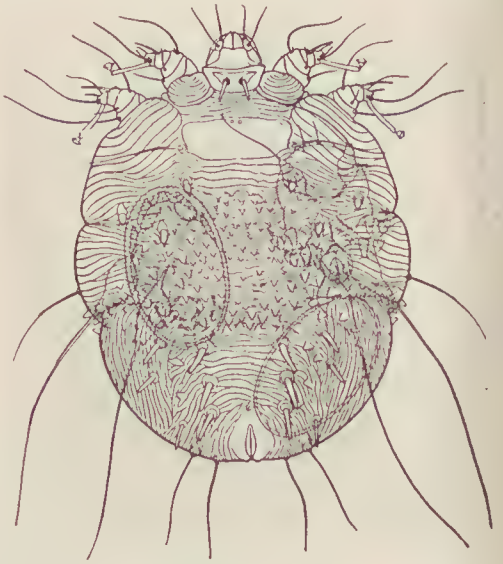


Fig. 4.—Adult female mange mite. Two eggs are clearly visible through the body wall. The eggs are extremely large compared with the size of the mite.

2. *Irritation.*

In an attempt to allay the irritation caused by the mites the pigs will bite themselves, or rub against stones, fence posts, &c. They will not infrequently bite or rub so hard that they tear their own skins, and extensive and deep bruising may be caused. These secondary injuries further reduce the value of the carcass, and if the wounds become infected with pus-forming bacteria, life itself may be endangered.

3. *Loss of Sleep and Condition.*

A more serious and less obvious effect is the loss of condition occasioned by irritation and loss of sleep.

Animals utilize the food they eat in two ways, first to provide energy to carry out ordinary bodily functions such as walking, eating, &c., and secondly to build up and replace the tissues of the body. If the food supply falls off, or the animal requires more energy for maintenance and work, the food intended for body-building is diverted and the animal fails to grow. In the case of a rapidly-maturing animal like the pig, this is very important, as not one ounce of food can be spared from body building.

In a lightly-infested herd it was found that the pigs required twice as much food to make 1 lb. gain in weight as they would under normal circumstances. This observation makes it clear why heavily-infested animals fail to grow at all, and even at times lose weight.

How Infection Spreads.

Mange is an infectious disease, and can only arise by the transference of mites or their eggs from a diseased animal to a healthy one. As the mites are unable to fly, this limits infection to direct or indirect contact.

Direct contact occurs when pigs are close together for a sufficient length of time for mites to crawl from one to another. Pigs huddled together on a sleeping platform provide ideal conditions for the spread of infection.

Indirect contact is theoretically possible, but in actual practice it is not of very great importance. In this case mites or their eggs are detached from diseased pigs and lodge on the sides of sties or in bedding, later coming in contact with healthy animals using the same sties.

It is not known exactly how long mange mites will live once they have been removed from the host, but as they are killed by sunlight and the drying action of air, they survive probably only for a few days.

Control Measures.

The first and most important point to remember is that mange is an infectious disease, and must be treated as such. If infection is discovered in a herd it is essential to examine thoroughly every pig in the herd and place in isolation every pen in which infected animals are found. This segregation of the contacts as well as the infected pigs is important, because the contacts may be incubating the disease, and they may reinfect the herd at a later date.

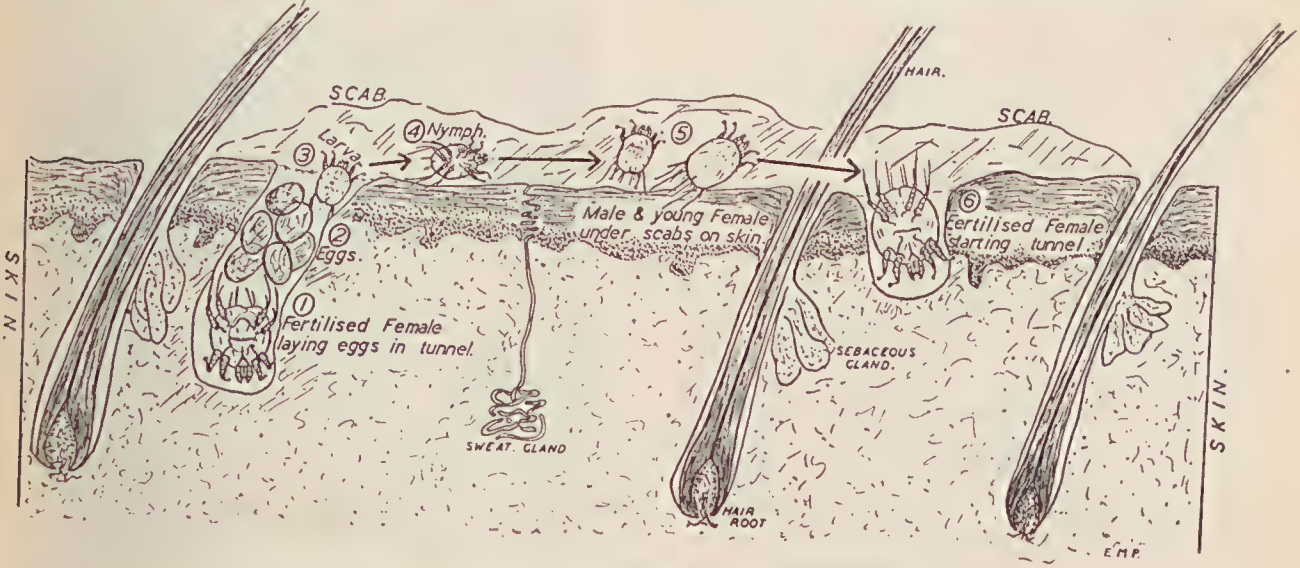


Fig. 5.—Life cycle of the mange or scab mite.

Having taken these measures to limit or stop the spread of infection, the next step is to treat the diseased animals. The labour involved can be considerably reduced by eliminating all cases in which the trouble and expense would not be justified. Such cases fall into the following categories:—

(1) Lightly-infected porkers and baconers almost up to market weight.
(2) Sows and boars which should be culled in any case because of other faults.
(3) Runts and other badly-infected animals in poor condition.

Those in groups 1 and 2, and a few in group 3 should be sold for immediate slaughter. The remainder of group 3 are destroyed on the farm, as they have no residual value, and because they seldom make satisfactory growth after a severe set-back.

Mange is a disease which readily responds to treatment; in fact, an occasional animal will make a spontaneous recovery without treatment. The following preparations have been used with varying degrees of success:—Sheep dips (arsenical, carbolic, and cresylic), tincture of iodine, sulphur ointment and other sulphur preparations, and even sump oil.

An ideal treatment must be—

(*a*) Cheap.
(*b*) Sure in its action.
(*c*) Non-poisonous, i.e., harmless to patient and operator.
(*d*) Simple to prepare and apply.
(*e*) Not spoiled by storage.

As no known preparation comes up to the ideal, there is a constant search for more satisfactory remedies. The Veterinary Research Institute of the Melbourne University recently has contributed to this search, and has elaborated a new type of treatment which gives extraordinarily good results, and comes somewhat nearer the ideal than any other encountered.

There is no known treatment which will destroy the eggs of the mites unless it is so severe in its action that it will also injure the skin of the host. For this reason it is necessary to repeat the treatment after a lapse of time long enough to permit all the eggs to hatch, but short enough to kill the newly-hatched mites before they can lay a fresh batch of eggs. This period has been fixed at four (4) days. In actual practice it is found that it is necessary to give a third treatment after another period of four days to kill the few mites which may have survived the second treatment.

Three New Treatments Tested.

Recently officers of the Veterinary Research Institute have been able to test three new treatments for mange under field conditions. They were as follow:—

1. *"Hypo" and "Spirits of Salts"* is a treatment which first came into prominence a few years ago for the treatment of mange in men and dogs. It is in effect another method of applying sulphur, but it depends on a new principle. A strong solution of ordinary commercial "Hypo" (used for fixing photographic prints and negatives) is painted on the skin. The hypo solution is left on to dry out (5 to 10 minutes). A dilute solution of spirits of salts is then painted on. Hypo is a sulphur-containing salt, and the acid causes it to break down, setting the sulphur free and depositing it in the skin. Thus the sulphur is brought into intimate contact with the mites.

2. and 3. *Emulsified Neatsfoot Oil* with *Sulphur or Derris.*

Recently Carse (*Agricultural Gazette of New South Wales,* July, 1940, p. 357) described the application of an emulsion of neatsfoot oil through a spray pump, for the control of lice in pigs. This new departure may revolutionize the treatment of skin diseases in animals, as it is simple and easy to apply, and appears to cause less discomfort to the patient.

In preparing the emulsion, the oil is mixed with twice its volume of water and emulsified or broken up into a milky solution by the addition of a small quantity of washing soda.

This emulsion appeared to offer a number of advantages as a vehicle for the application of other drugs, because it is cheap, spreads well, and sticks to the hair In addition, it *cleans* the pig's coat instead of making it dirty, and so can be used on animals being prepared for show purposes. And above all it does not irritate the skin like sump oil.

Other vegetable or animal oils, such as peanut, coconut, maize, raw linseed, bone, shark, or whale oils, &c., could be used in place of neatsfoot oil, but as the latter is readily obtainable and very cheap the others offer no particular advantage.

As stated above, the idea of utilizing this emulsion was conceived as a basis for the application of mange dressings, and the possibilities of adding to it derris powder and sulphur preparations have been tested. The addition of derris is not satisfactory, as it curdles the emulsion, so that it will not pass through the jet of the spray pump. The sulphur preparations were quite satisfactory.

Experimental Trial.

For the purpose of this trial the co-operation of a farmer near Melbourne was obtained. Mange had been introduced into his herd several years before, but owing to a high standard of husbandry and the liberal, almost to the point of excessive use of sump oil, the disease had been held more or less in check. In this case the principal effect of the disease was to slow down the rate of growth of the young stock.

The author visited the premises and was able to confirm the diagnosis by demonstrating the presence of mange mites in scabs on the skin.

Twenty pigs were selected for treatment. These were not picked out because they were regarded as favorable cases, but because they were in sties and were always available for observation or treatment. The remainder of the herd were in paddocks. The twenty selected cases comprised one sow heavy in pig, ten forward porkers (about 4 to 5 months old), and nine slips (about ten weeks old). These pigs were divided into three groups.

Group 1.—One sow and two porkers These were treated with Hypo and Spirits of Salts (see treatment No. 1).

Group 2.—Three porkers. These were treated with Neatsfoot Oil Emulsion to which 1 per cent. Derris Powder had been added. As the mixture curdled it had to be painted on with a brush.

Fig. 6.—The knapsack spray pump, as used for treating large herds. [Agric. Gaz. N.S.W.

Fig. 7.—The hand spray pump, as used in the average sized herd. This type of pump is known as the "Brass Continuous Atomiser". [Agric. Gaz., N.S.W.

Group 3.—Five porkers and nine slips. These were treated with Neatsfoot Oil Emulsion containing 1·5 per cent. sulphur.

No attempt was made to keep the three groups separate. The sow was in one pen, the ten porkers in another, and the nine slips in a third. This ensured that the porkers were exposed to the same risk of reinfection. With Groups 1 and 3 the mixture was applied by means of a Brass Continuous Atomizer (see Fig. 7). Each group was treated on the same day. Three treatments were given at four-day intervals. Seven days after the last treatment (i.e., fifteen days from the commencement of the experiment) all the pigs were carefully examined. The results were as follow:—

Group 1.—Considerable improvement, but not a complete cure. Even though the mites were being slowly destroyed it could not be regarded as a satisfactory treatment, as the skin under the detached scabs was harsh and dry. Another one or two treatments would have been required to produce a complete cure. Even then the skin would probably have taken some time to return to normal.

Group 2.—Considerable improvement, but not a complete cure. More than half the scabs had detached, leaving a clean healthy skin underneath.

Group 3.—Complete cure. The scabs had commenced to fall off between the second and the third treatment, and at the time of the final observation all the scabs had disappeared, leaving a clean healthy skin.

The failure of the Hypo and Spirits of Salts is attributed to the fact that the greasy skin of the pig prevents its rapid penetration. In addition, the drying effects on the skin is a considerable disadvantage. On the other hand, the results with the emulsion containing sulphur were spectacular, and the author has no hesitation in recommending its use.

Subsequent investigation showed that the sulphur could be replaced with *potassium sulphurata* (sulphurated potash), which overcomes the difficulty of grinding up the sulphur in oil. Its odour, which is strong and pungent, and resembles rotten eggs, is a minor disadvantage. Once the dressing is applied to the skin the smell soon passes off.

The New Treatment.

Ingredients	Quantity.	Cost.
Neatsfoot Oil ..	1 quart ..	@ 9/- gal.=2/3
Clear Soft Water ..	2 quarts ..	— —
Washing Soda ..	2 Teaspoonsful	— —
Potassium Sulphurata	1 ounce ..	@ 5/- lb. = -/4
	Total 3 quarts	@ 2/7

Directions.

Place the lumps of washing soda and *potassium sulphurata* in the water in a suitable container, such as a kerosene tin, and bring it to the boil. When the solid ingredients have dissolved, *take the tin off the fire,* and slowly pour in the oil stirring all the time. The oil emulsifies at once producing a milky white solution which does not settle out. The mixture can be used as soon as it is cool or stored until it is required. It should never be prepared or stored in an enamel container as it will blacken the enamel.

Neatsfoot oil can be purchased from any general store, saddler, or leather merchant. *Potassium sulphurata* must be bought from a chemist. It should be kept in an air-tight container, otherwise it will take up moisture from the air and turn into a sticky mess.

Method of Application.

The most satisfactory method of applying mange dressing is by means of a spray pump. For all except very large herds, the type known as the "Brass Continuous Atomizer" (see Fig. 7) is quite suitable. This type of pump costs about 8s. 6d. in Melbourne, and can be purchased from any of the larger stores, or from florists or orchardists suppliers. The spray liquid is placed in the circular container below the pump, and it is forced out through the jet by pumping air into the container. There is very little wear in this type of instrument, and with reasonable care and regular cleaning it will last for years.

More elaborate pumps of the Knapsack Type can be used (see Fig. 6), but as they cost from £4 to £6 this expense would only be justified if large numbers had to be treated every day, and the pump kept in continuous use.

The easiest method of applying the dressing to small porkers and larger pigs is to run them into a small drafting yard, about 5 feet square. A corner or portion of a pen or drafting race blocked off with a hurdle is quite satisfactory. In such a confined space the pigs will stand quite still without any further restraint.

The emulsion should be sprayed *all over the pig,* particular attention being paid to all obviously affected parts, the bridge of the nose, butt of the tail, feet (inside and outside surfaces), and *inside* the ears. The emulsion does not irritate the eyes, so that the head can be sprayed as well as the rest of the body. *Do not spray directly into the eyes* as the force of the jet might injure them. If the spray is commenced slowly the pig will close its eyes, and it is then safe to proceed with the full force of the jet.

Suckers and small slips are best treated with an assistant holding them up by the hind legs. After the body and head are sprayed the assistant takes the pig by the shoulders while the hind legs are treated.

When treating an infested herd do not attempt to do too many animals at once. Time will only be wasted if it is impractical to repeat the treatment at the correct interval (four days). It is much better to start on a small portion of the herd and cure them completely, then later start on another group. By this means it will be possible to rid the herd from infection without dislocating the working of the farm. One man can treat 15 to 20 pigs in an hour, and it is suggested that not more than one hour be devoted to mange control in any one day.

Further Control Measures.

After the pigs have been given three, or possibly four, treatments there may be a few which have not responded very well, or are not growing at a satisfactory rate. It is more economical to sell these for whatever they will bring, rather than go to further trouble and expense.

[Continued on page 126.

POTATO MANURIAL TRIALS

Results for 1939-40

By G. H. Mattingley, Potato Field Officer.

UP to February of last year, potato prospects looked very good indeed. Conditions at planting time were the best experienced for some years, and the crops made steady headway, helped by timely falls of rain. The early crops in the market garden areas and in the Western District yielded well, and high hopes were entertained for a generally good season.

However, during February the outlook changed completely. Dry conditions and high winds experienced over the greater portion of the month materially checked the development of crops in the late districts, and towards the end of the month a sequence of severe frosts did considerable damage. Unusually hot and dry conditions during April further checked the crops, and yields were reduced to such an extent that in most cases they were the lightest on record.

It is estimated that only 65,000 tons of potatoes were harvested in Victoria during the season under review, or an average yield of approximately 2 tons per acre.

Romsey.

The Romsey plots were sown on 10th November with the Late Carman variety. Dry weather was experienced right up to the beginning of March, and light yields were harvested. Although, as is generally the rule at Romsey, the plots derived little benefit from the manures applied (see Table I.), the average returns given in Table II. show that a small increase is gained in each case through the application of artificial fertilizer.

TABLE I.—POTATO MANURIAL TRIALS, ROMSEY, 1939-40.

Manure per Acre.	Weight Marketable Tubers.
	T. C.
No manure	2 16
Super. 2 cwt.	3 4
Super. 3 cwt.	2 19
Super. 4 cwt.	2 19
Super. 3 cwt. + amm. sulph. 1 cwt. ..	3 7
Super. 3 cwt. + amm. sulph. 2 cwt. ..	3 7

TABLE II.—AVERAGE RESULTS, ROMSEY, FOR EIGHT YEARS 1932-33 TO 1939-40.

Manure per Acre.	Average Yield.	Increase Due to Manure.	Value of Increase at £5 per Ton.	Cost of Manure per Acre.	Extra Return per Acre due to Manure.
	T. C.	T. C.	£ s. d.	£ s. d.	£ s. d.
No manure ..	4 12	..	..	..	..
Super. 2 cwt.	5 3	0 11	2 15 0	0 7 6	2 7 6
Super. 3 cwt.	5 6	0 14	3 10 0	0 11 3	2 18 9
Super. 4 cwt.	5 3	0 11	2 15 0	0 15 0	2 0 0
Super. 3 cwt. + amm. sulph. 1 cwt. ..	5 16	1 4	6 0 0	1 6 8	4 13 4
Super. 3 cwt. + amm. sulph. 2 cwt. ..	5 19	1 7	6 15 0	2 0 1	4 14 11

Wheatsheaf.

Sown on 13th November and harvested on 13th June, 1940, the Wheatsheaf plots showed little response to manure this season. The variety used was Snowflake, which in the past has shown substantial increases when manured. In Table IV. the average yield from the standard application of "3:1" is 5 tons 14 cwt. per acre. Valuing the potatoes at £5 per ton this gives an extra return of £8 3s. 4d. per acre after deducting the cost of the fertilizer.

TABLE III.—POTATO MANURIAL TRIALS, WHEATSHEAF, 1939-40.

Manure per Acre.	Weight Marketable Tubers.
	T. C.
No manure	3 17
Super. 2 cwt.	3 10
Super. 3 cwt.	3 0
Super. 4 cwt.	3 0
Super. 3 cwt. + amm. sulph. 1 cwt. ..	4 2
Super. 3 cwt. + amm. sulph. 2 cwt. ..	4 9

TABLE IV.—AVERAGE RESULTS, WHEATSHEAF, FOR EIGHT YEARS 1932-33 TO 1939-40.

Manure per Acre.	Average Yield.	Increase Due to Manure.	Value of Increase at £5 per Ton.	Cost of Manure per Acre.	Extra Return per Acre due to Manure.
	T. C.	T. C.	£ s. d.	£ s. d.	£ s. d.
No manure ..	3 16	..	..	..	..
Super. 2 cwt.	4 7	0 11	2 15 0	0 7 6	2 7 6
Super. 3 cwt.	4 13	0 17	4 5 0	0 11 3	3 13 9
Super. 4 cwt.	4 15	0 19	4 15 0	0 15 0	4 0 0
Super. 3 cwt. + amm. sulph. 1 cwt. ..	5 14	1 18	9 10 0	1 6 8	8 3 4
Super. 3 cwt. + amm. sulph. 2 cwt. ..	5 16	2 0	10 0 0	2 0 1	7 19 11

Potato planting attachment on plough used by Messrs. Bull Bros., Musk.

Musk.

The plots at Musk, in common with most of the others in the central highlands, showed very little response to super. this season (Table V.). However, the average results given in Table VI. indicate that, as a general rule, the application of manure is profitable in every instance, and that the yield increases as the rate of the manurial dressing is increased. The application of sulphate of ammonia causes quite a considerable increase in the yield, and for each cwt. applied there is an extra return of approximately £2 per acre with potatoes at £5 per ton.

TABLE V.—POTATO MANURIAL TRIALS, MUSK, 1939-40.

Manure per Acre.	Weight Marketable Tubers.
	T. C.
No manure	2 2
Super. 2 cwt.	2 2
Super. 3 cwt.	2 7
Super. 4 cwt.	2 10
Super. 3 cwt. + amm. sulph. 1 cwt. ..	2 7
Super. 3 cwt. + amm. sulph. 2 cwt. ..	2 17

TABLE VI.—AVERAGE RESULTS, MUSK, FOR EIGHT YEARS 1932-33 TO 1939-40.

Manure per Acre.	Average Yield.	Increase Due to Manure.	Value of Increase at £5 per Ton.	Cost of Manure per Acre.	Extra Return per Acre due to Manure.
	T. C.	T. C.	£ s. d.	£ s. d.	£ s. d.
No manure ..	3 8	..	..	..	..
Super. 2 cwt.	4 7	0 19	4 15 0	0 7 6	4 7 6
Super. 3 cwt.	4 13	1 5	6 5 0	0 11 3	5 13 9
Super. 4 cwt.	4 14	1 6	6 10 0	0 15 0	5 15 0
Super. 3 cwt. + amm. sulph. 1 cwt. ..	5 6	1 18	9 10 0	1 6 8	8 3 4
Super. 3 cwt. + amm. sulph. 2 cwt. ..	5 17	2 9	12 5 0	2 0 1	10 4 11

A crop of "Snowflakes" on the property of Mr. Toomey, Trentham.

Trentham.

Trentham plots have always been notable for the fact that the heavy dressing of "3:2" super. ammonia pays the best dividends. Even last season, under adverse conditions, the heavy application proved to be the best. The average results in Table VIII. show that an increase in yield of over 100 per cent. may be obtained by its use.

TABLE VII.—POTATO MANURIAL TRIALS, TRENTHAM, 1939-40.

Manure per Acre.	Weight Marketable Tubers.
	T. C.
No manure	2 4
Super. 2 cwt.	2 4
Super. 3 cwt.	3 1
Super. 4 cwt.	3 1
Super. 3 cwt. + amm. sulph. 1 cwt. ..	3 6
Super. 3 cwt. + amm. sulph. 2 cwt. ..	4 3

TABLE VIII.—AVERAGE RESULTS, TRENTHAM, FOR EIGHT YEARS 1932-33 TO 1939-40.

Manure per Acre.	Average Yield.	Increase Due to Manure.	Value of Increase at £5 per Ton.	Cost of Manure per Acre.	Extra Return per Acre due to Manure.
	T. C.	T. C.	£ s. d.	£ s. d.	£ s. d.
No manure ..	3 1	..	..	..	..
Super. 2 cwt.	3 17	0 16	4 0 0	0 7 6	3 12 6
Super. 3 cwt.	4 12	1 11	7 15 0	0 11 3	7 3 9
Super. 4 cwt.	4 13	1 12	8 0 0	0 15 0	7 5 0
Super. 3 cwt. + amm. sulph. 1 cwt. ..	5 9	2 8	12 0 0	1 6 8	10 13 4
Super. 3 cwt. + amm. sulph. 2 cwt. ..	6 6	3 5	16 5 0	2 0 1	14 4 11

Newlyn.

A plot was established at Newlyn last season. It was unfortunate that in its initial year, the area should have been subject to heavy frosts and very poor yields resulted, but the returns were such as to provoke considerable interest in the experiments in future years. The results obtained are set out in Table IX.

TABLE IX.—POTATO MANURIAL TRIALS, NEWLYN, 1939-40.

Manure per Acre.	Total Weight Harvested.
	T. C.
No manure	0 5
Super. 3 cwt.	1 1
Super. 1½ cwt. + amm. sulph. ¼ cwt. ..	0 18
Super. 3 cwt. + amm. sulph. 1 cwt. ..	1 10
Super. 3 cwt. + amm. sulph. 2 cwt. ..	1 11
Super. 3 cwt. + amm. sulph. 1 cwt. + pot. sulph. 1 cwt.	1 9

Beech Forest.

Unlike most of the potato-growing areas of Victoria, the Otway district had a good season for potatoes. The weather being drier than normal, the crops grew under ideal conditions, and heavy yields were the rule. However, the area planted during the present season in this district—approximately 400 acres—is too small to materially influence market prices.

As is usually the rule, the heaviest rating of manure—super. 9 cwt. + ammonia sulphate 2 cwt.—gave the best returns, but possibly because of the drier conditions did not yield greatly in excess of other applications approaching it in quantity. In fact, the complete manure gave an equal yield, but this is unusual. Table XI. shows that the average of results favours the heaviest dressing, which gives an extra return per acre of £19 18s. 5d.

Planting potatoes at Beech Forest, 1939.

TABLE X.—POTATO MANURIAL TRIALS, BEECH FOREST, 1939-40.

Manure per Acre.	Weight Marketable Tubers.
	T. C.
No manure	4 0
Super. 6 cwt.	5 15
Super 6 cwt. + amm. sulph. 1 cwt. ..	6 0
Super. 6 cwt. + amm. sulph. 2 cwt. ..	6 10
Super. 6 cwt. + amm. sulph. 1 cwt. + pot. sulph 1 cwt.	7 3
Super. 9 cwt.	6 5
Super. 9 cwt. + amm. sulph. 1 cwt. ..	5 15
Super. 9 cwt. + amm. sulph. 2 cwt. ..	7 3

TABLE XI.—AVERAGE RESULTS, BEECH FOREST, FOR NINE YEARS 1931-32 TO 1939-40.

Manure per Acre.	Average Yield.	Increase Due to Manure.	Value of Increase at £5 per Ton.	Cost of Manure per Acre.	Extra Return per Acre due to Manure.
	T. C.	T. C.	£ s. d.	£ s. d.	£ s. d.
No manure ..	3 10	..	.. ..	.. ..	.. ..
Super. 6 cwt.	5 7	1 17	9 5 0	1 2 6	8 2 6
Super. 6 cwt. + amm. sulph. 1 cwt. ..	7 3	3 13	18 5 0	1 19 11	16 5 1
Super. 6 cwt. + amm. sulph. 2 cwt. ..	7 10	4 0	20 0 0	2 13 4	17 6 8
Super. 6 cwt. + amm. sulph. 1 cwt. + pot. sulph. 1 cwt.	7 2	3 12	18 0 0	2 16 0	15 4 0
Super. 9 cwt.	5 16	2 6	11 10 0	1 13 9	9 16 3
Super. 9 cwt. + amm. sulph. 1 cwt. ..	7 7	3 17	19 5 0	2 13 2	16 11 10
Super. 9 cwt. + amm. sulph. 2 cwt. ..	8 3	4 13	23 5 0	3 6 7	19 18 5

Toombullup.

Planted on 8th December, 1939, the plot at Toombullup met with very dry conditions, and only light yields were obtained (Table XII.). These plots have been in existence for three years only, and it is too early to draw any definite conclusions until a wider range of seasonal conditions has been experienced over a period of years. At the moment, the dressing of super. 6 cwt. + ammonia sulphate 1 cwt. seems to give the most profitable return. (Table XIII.)

TABLE XII.—POTATO MANURIAL TRIALS, TOOMBULLUP, 1939-40.

Manure per Acre.	Weight Marketable Tubers.
	T. C.
No manure	1 10
Super. 3 cwt.	1 3
Super. 3 cwt. + pot. sulph. 1 cwt. ..	0 19
Super. 3 cwt. + amm. sulph. 1 cwt. ..	1 12
Super. 3 cwt. + amm. sulph. 1 cwt. + pot. sulph. 1 cwt.	2 2
Super. 6 cwt.	1 10
Super. 6 cwt. + pot. sulph. 1 cwt. ..	1 3
Super. 6 cwt. + amm. sulph. 1 cwt. ..	1 7
Super. 6 cwt. + amm. sulph. 1 cwt. + pot. sulph. 1 cwt.	1 15

TABLE XIII.—AVERAGE RESULTS, TOOMBULLUP, FOR THREE YEARS 1937-38 TO 1939-40.

Manure per Acre.	Average Yield.	Increase Due to Manure.	Value of Increase at £5 per Ton.	Cost of Manure per Acre.	Extra Return per Acre due to Manure.
	T. C.	T. C.	£ s. d.	£ s. d.	£ s. d.
No manure ..	2 12	..	..	..	..
Super. 3 cwt.	3 4	0 12	3 0 0	0 11 3	2 8 9
Super. 3 cwt. + pot. sulph. 1 cwt. ..	2 15	0 3	0 15 0	1 9 4	..
Super. 3 cwt. + amm. sulph. 1 cwt. ..	4 1	1 9	7 5 0	1 6 8	5 18 4
Super. 3 cwt. + amm. sulph. 1 cwt. + pot. sulph. 1 cwt.	4 4	1 12	8 0 0	2 2 9	5 17 3
Super. 6 cwt.	3 9	0 17	4 5 0	1 2 6	3 2 6
Super. 6 cwt. + pot. sulph. 1 cwt. ..	3 11	0 19	4 15 0	2 2 6½	2 12 5½
Super. 6 cwt. + amm. sulph. 1 cwt. ..	4 11	1 19	9 15 0	1 19 11	7 15 1
Super. 6 cwt. + amm. sulph. 1 cwt. + pot. sulph. 1 cwt.	4 10	1 18	9 10 0	2 16 0	6 14 0

Neerim.

The plots at Neerim also have been established for only three years, and therefore no conclusions may be drawn as to the effects of any of the manurial treatments. However, it is already evident that potash is of benefit in this class of soil, as dressings, including this fertilizer, have been consistently higher yielding than any others.

It should be noted that in the foregoing tables the cost of the fertilizers is calculated from prices ruling in January, 1940, viz.:—Superphosphate, £3 15s. per ton; sulphate of ammonia, £12 14s. 6d.; sulphate of potash, £15 7s. 6d. per ton.

The figures given do not include freight on the manure, as it is such a variable quantity, or the cost of spreading. This latter is variable also, as in some cases the manure is spread by hand and in others by a machine planter.

Owing to the fact that some of the manurial dressings applied to the various plots may not be purchased ready mixed, it is assumed that all manures are bought separately, and an allowance of 8d. per cwt. is made for mixing.

In calculating the extra return per acre due to manure, £5 per ton was taken as a fair average price for potatoes. Actually, over the period of these trials the average price for marketable potatoes was much higher than that figure. The extra returns obtained, therefore, would be appreciably in excess of those given in the tables.

TABLE XIV.—POTATO MANURIAL TRIALS. NEERIM. 1939-40.

Manure per Acre.	Weight Marketable Tubers.
	T. C.
No manure	5 7
Super. 4½ cwt.	6 5
Super. 6 cwt.	5 7
Super. 6 cwt. + pot. sulph. 1 cwt. ..	6 7
Super. 6 cwt. + amm. sulph. 1 cwt. ..	6 5
Super. 6 cwt. + amm. sulph. 2 cwt. ..	7 7
Super. 6 cwt. + amm. sulph. 1 cwt. + pot. sulph. 1 cwt.	8 15

TABLE XV.—AVERAGE RESULTS, NEERIM, FOR THREE YEARS 1937-38 TO 1939-40.

Manure per Acre.	Average Yield.	Increase Due to Manure.	Value of Increase at £5 per Ton.	Cost of Manure per Acre.	Extra Return per Acre due to Manure.
	T. C.	T. C.	£ s. d.	£ s. d.	£ s. d.
No manure ..	5 3	..	..	..	..
Super. 4½ cwt.	7 1	1 18	9 10 0	0 16 10½	8 13 1½
Super. 6 cwt.	7 10	2 7	11 15 0	1 2 6	10 12 6
Super. 6 cwt. + pot. sulph. 1 cwt. ..	8 7	3 4	16 0 0	2 2 6½	13 17 5½
Super. 6 cwt. + amm. sulph. 1 cwt. ..	5 3	..	..	1 19 11	..
Super. 6 cwt. + amm. sulph. 2 cwt. ..	8 1	2 18	14 10 0	2 13 4	11 16 8
Super. 6 cwt. + amm. sulph. 1 cwt. + pot. sulph. 1 cwt.	8 19	3 16	19 0 0	2 16 0	16 4 0

Dimboola Crop and Fallow Competition, 1940

Report of the Judge, A. B. HACKWELL, B.Agr.Sc., Agricultural Instructor

THE Dimboola district embraces an extensive area of varying soils devoted to wheat-growing, including the black Wimmera plains to the east and south of the township, and Mallee and fringe land to the north. In 1940 another very dry year was experienced, although the season, on the whole, was considerably better than in the central and eastern sections of the Wimmera.

The rainfall at Dimboola last year, from May to November, was only 6½ inches—about 5 inches below the normal registration for that period. To the north-east, at Katyil and Wallup, the rainfall was lighter, those areas being on the margin of the very dry belt further east.

The district wheat yields in general ranged from moderate to light; the 26 crops in the competition (each 50 acres) were estimated to return from around nine bags per acre down to about four bags per acre. Considering the seasonal conditions the crops produced in the Dimboola district last year were a decided achievement, and this could be attributed to the high standard of wheat-growing methods now adopted, especially in regard to fallow preparation and the use of improved varieties.

As a general rule, the farmers who obtain the best results, year in and year out, are those who consistently pay careful attention to their fallowing. The extra moisture and plant food conserved in the fallow assist the crop to tide over periods of rain shortage. Wimmera wheat growers have long realized that the production of high-average crops is dependent on efficient fallowing, and the advantage of good fallow was well demonstrated in the past season.

Cultivation trials conducted by the Department of Agriculture on Wimmera black land at Longerenong College for the last twelve years indicate how wheat yields can be depressed if the standard fallowing treatments are not undertaken.

In these tests summer fallow has given a slightly higher average yield than winter fallow, although each type showed to advantage in different years. One of the most interesting results was the reduced yield from late fallowing. Land ploughed in October yielded 26·0 bushels per acre, a reduction of nearly 10 bushels compared with winter fallow. The trials emphasize the importance of early fallowing in the Wimmera, and demonstrate the advantage gained by completing the fallowing in July-August, if seasonal conditions permit. A practice recommended is that sufficient area of summer fallow should be prepared to provide an early completion of the fallowing programme. The advantages of adequate cultivation are also demonstrated, and the results show that the use of sheep alone during the spring and summer months is not sufficient preparation for Wimmera land.

FALLOW CULTIVATION TRIALS—LONGERENONG.
Summarized Results.

	Wheat Yield. Av. 12 years. Bush./acre.
Summer Fallow (average of seven types)	36·6
Winter Fallow (average of five types)	35·8
Late Fallow (October) ..	26·0
Sheeped Winter Fallow (no cultivation August till autumn)	22·8
Non-fallow (not ploughed till autumn)	12·7

The suppression of weeds on the fallow is a matter of particular importance in so far as subsequent yields are concerned. Weeds which are permitted to develop deplete the reserves of moisture and plant food being stored in the ground, and some types, principally barley grass, act as hosts for take-all disease, and enable it to be propagated in the soil.

Wheat Varieties.

For many years Ghurka has been the predominant variety sown in the Dimboola district, and on most farms has proved itself a prolific grain yielder. Two new varieties are now available for trial by Wimmera growers, namely Magnet and Quadrat (formerly known as Ghurka x C.M.G.).

Magnet is a white-chaffed, late wheat with a fairly tall, strong straw. Over an extended period it has out-yielded Ghurka in the Wimmera tests on black ground, and has done fairly well on the red and mixed land. It is also a useful wheat for hay purposes. Under the dry conditions last year, Magnet, on many

farms, was appreciably "tipped"; some growers, however, reported very good yields with that variety.

Quadrat has been approved by the Victorian Wheat Advisory Committee for distribution in the Wimmera, and all supplies this season have been allotted. This new variety has shown outstanding yielding ability in the Wimmera trials, particularly on black land. It is brown chaffed, mid-season in maturity, and is about equal to Ghurka in flour quality and disease resistance. It is a free stripping wheat like Ghurka, and is slightly taller, with a strong straw.

Other new varieties attracting interest are Bencubbin, Regalia, and Pindar (formerly known as Ghurka Selection). These are three of the leading wheats in the Mallee plots, but up to date have not been prominent in the Wimmera tests. Possibly they may prove useful, like Ranee 4H, on the fringe and Mallee land in the Dimboola district and northern section of the Wimmera. Experiments to test the varieties on such soils were commenced at Warracknabeal last season.

Zinc Sulphate.

Following the discovery in the Nhill district by the Department of Agriculture in 1936 of the possibilities of zinc sulphate, applied with superphosphate, in increasing the yield of wheat crops in the Wimmera, many Dimboola farmers are testing the material on bulk areas. In some cases definite responses have been obtained, while in others no effect of the mineral was apparent. Zinc sulphate costs approximately 2d. per lb., and as the requisite dressing—5 to 10 lb. per acre—is comparatively cheap, only a small increase in the wheat yield is required to warrant it use.

In recent years Departmental tests with the mineral have been undertaken at many centres. The extra yield in the Nhill plots in the three-year period 1937-39, on the average, ranged from 2½ bushels to 5 bushels an acre, and at Longerenong from 1 to 2½ bushels an acre. Similarly, in the Kaniva district a definite response of 1 to 4 bushels an acre occurred in several tests in 1938-39, while on two sites the zinc had no effect. In the very dry season of 1940, the response in all tests, in general, was much lower than in previous years.

Reviewing all the evidence to date, the various experiments demonstrate that on many farms in the Wimmera, particularly on the black soils in the western section of the district, the use of zinc sulphate is an economic means of increasing the wheat yield on fallowed land.

Wheat growers desirous of testing the mineral on their own paddocks are advised to apply it at the rate of 5 to 10 lb. per acre, mixed with the usual dressing of superphosphate. The mixing can be done on the farm any time before cropping—the materials should be reasonably dry, and kept in that condition. Alternatively, farmers can purchase superphosphate and zinc sulphate already mixed in appropriate amounts.

It is recommended that where zinc sulphate is used, there should be no reduction in the amount of superphosphate that would be applied normally. Further, when testing the mineral it is very advisable to leave in each paddock some strips sown without zinc sulphate, so that comparisons can be made between the treated and untreated crop.

The Competition.

Considering the dry year, the total entry of 26 crops and 24 fallows in the various sections of the competition was very satisfactory.

Messrs. W. G. and O. C. Pietsch, who won both the *open* and *Wimmera land* aggregate sections, grew some splendid crops for the year. Their three entries—each 50 acres—were estimated to yield an average of about 27 bushels an acre, and they had the distinction of again providing the crop which represented the Dimboola district in the contest for the Champion Wheat Crop of the Wimmera.

Factors which contribute to the high average yields usually obtained on this farm are:—good fallowing, efficient workmanship, and the fact that the crop is normally sown in a three-course rotation, mainly fallow-wheat-grass or fallow-wheat-oats for grazing.

In each crop of Messrs. Pietsch Brothers the purity of the crop was of high standard and there was very little disease. The winning entry in the Open Section (Ghurka) had been sown early (second week in May) with 75 lb. of seed—pickled with mercurial powder—and 80 lb. of super. per acre. The fallow had been ploughed in July, harrowed three times, and scarified twice during August to October, and harrowed with shear points in February. The crop was very dense, and over the bulk of the area it was well headed.

In the other two entries the fallows had been given a final scarifying and harrowing in May and sown in the second week of June with seed and super., both at 80 lb. per acre. As with the previous exhibit, the wheat was not fed off. The Free Gallipoli was a very attractive crop, even, fairly thick, with well-filled heads.

Messrs. Westendorf Bros. also presented two very creditable crops, Ghurka and Bobin, which gained second award in each section. These farmers are among the few using horses only, and give their fallows liberal working. The two-course rotation, fallow-wheat, is generally used on this farm, the oats being sown on fallow. The two exhibits were on summer fallow, worked four times with the scarifier and harrows during winter and spring, harrowed with shears in February, and finally scarified and harrowed in May. The crops were sown about mid-June with 85 lb. of seed per acre, and super. at 93 and 100 lb. per acre. Zinz sulphate at 6 lb. per acre was applied in each case, and the crops were harrowed a week after sowing and not fed off.

Of the other crops on black land the best were those of Messrs. H. F. Budde, H. E. Holland, and M. K. Fechner (No. 1 entry).

In the *Mallee Fringe* section, the two crops of Mr. B. H. Zanker, grown on last year's winning fallows, were outstanding. The Ghurka, in particular, was an excellent crop for the year, and would give a very creditable yield. It was very clean, pure, and even throughout. The other entry, Ranee 4H and Magnet, was on more mixed land, and the wheat was very heavy over many acres, with intermittent light patches. Both fallows had been worked over with a combine in May, and sown later that month with 75 lb. of dry pickled seed and 60 lb. of super. per acre, and the crop was not fed off.

In the *Mallee Land* section, Mr. E. F. Jensz was successful with an attractive crop of Regalia. Although not dense, the exhibit was well headed, fairly even, and particularly free from weeds. The variety was of excellent type. The paddock had been ploughed and harrowed in July, and one spring working was given with the combine. The fallow was subsequently combined after the "break" in April, and sown in the last week of June with 65 lb. of seed (pickled mercurial powder) and 90 lb. of superphosphate per acre. The crop was not grazed.

Mr. V. Harder's No. 1 entry—a commendable crop of Ranee 4H—was also worthy of special mention.

The Fallows.

Most of the competitors had taken advantage of the good rains in November (183 points at Dimboola) to work over their fallows and make up some of the leeway resulting from the limited opportunities for cultivation during the dry spring months. The exhibits, generally, were in splendid order considering the year was so unfavorable for fallow preparation. In most cases there was good moisture conservation and very little weed growth. As would be expected, the consolidation in the seed bed was not so pronounced as usual.

In the *Wimmera Land* section, Messrs. W. G. and O. C. Pietsch's fallow was considered the best of several very good entries. Their fallow had been worked down well, and showed an even, loose mulch, and a level, solid seed bed. It was quite moist and very clean. The paddock was scarified in early July, harrowed in August, and again in September, scarified in October, and harrowed with shear points in November.

Mr. M. K. Fechner's entry, on a rich loamy flat, was very moist, free from weeds, with an even seed bed and a fairly deep mulch. The land had been summer-fallowed with a sundercut, scarified in April and, to cope with weeds, a further scarifying was given in May. It was then harrowed in August and in September, and scarified in November.

In the *Mallee Fringe* section Mr. N. L. Harders gained first award. His two exhibits had been ploughed in May-June, harrowed, scarified in September, harrowed, then scarified again in November. The stubble had been ploughed in to check the drift. The No. 1 entry was on more even land, and was the better of the two.

Mr. W. G. Sallmann's fallow was very moist, with the mulch of good depth and fair texture. It had been ploughed in early August, harrowed twice, scarified mid-October, and harrowed in November.

In the *Mallee Land* section, Messrs. G. J. Glatz and E. F. Jensz were the winners. Mr. Glatz exhibited four paddocks, three of which were in splendid order. With team and tractor they had been fallowed with a sundercut and plough in June, and scarified in July, October, and November. All exhibits showed very high moisture, with practically no weeds. The mulch on No. 2 entry (sandy loam) was fairly deep, and the No. 4 entry had not been given the third scarifying.

Mr. Jensz's fallows were in first class order. One had been ploughed in July, the other (No. 2) sundercut in March and scarified in July. Both were then harrowed and, after the November rains, given another scarifying and harrowing.

JUDGING CORRIEDALE SHEEP

A Dual Purpose Breed

By

N. A. BOWMAN,

Sheep and Wool Expert

The accompanying photographs illustrate in detail the correct method of judging Corriedale sheep. The Corriedale breed represents a sheep bred to develop true dual purpose characteristics, and, therefore, in assessing this "ideal" aimed at by breeders, it is essential to keep in view the full purpose of the breed, and not to become "wool conscious" entirely, or consider that the covering of the animal is of primary importance in judging. The fundamental basis of a dual purpose sheep is a solid carcass foundation on which to place a covering of bulky attractive wool—true to type, with necessary handle and other features that provide a wool that commands attention.

(1). Stand off the sheep and measure up the general appearance for conformity to type, balance and bone

(2). Examine the head, feel for horns; note strength of head and face, muzzle markings, width between ears, and poll development, &c.

(4). Width and spring of forequarters and shoulder setting.

(3). Handle for back line trueness; flat square shoulders; strong level back.

(5). Wide quarters must be carried through, also note depth as well as width during frame examination.

(6). Hindquarters to be square and full as possible; width must be carried through. Tail setting-high is important for this development.

(7). Open shoulder wool—look for length, character, body, and handle.

(8). Never fail to close up the wool, no matter where you have opened it.

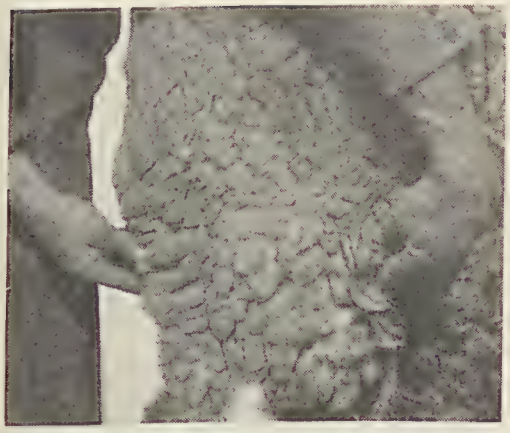
(9). Work toward the breech, noting change from general standard of covering as displayed on shoulder section.

(10). A fleece of uniform type and quality is essential in the make-up of a sound animal.

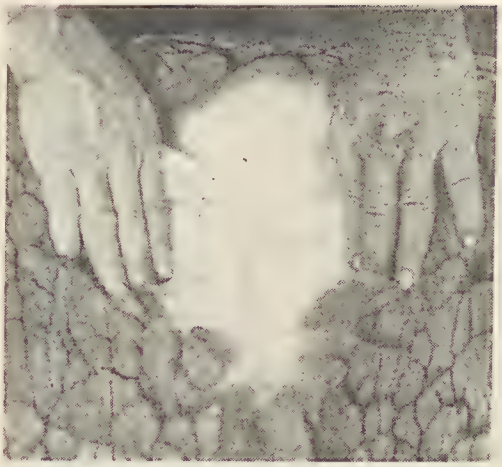
(12). Low down mid-rib covering, still displaying character, body and style.

(11). The lower regions of the covering are now examined — wool of true soundness should be well carried down at all points.

(13). Reasonable evenness throughout the entire fleece at all points is essential.



(14). Good bulky thigh development; sheep must have maximum of sound, bulky, true wool everywhere.



(16). A close view of mid-backline, displaying soundness.

(15). Solid back-line covering is all-important.

(17). Solid top of rump covering, one of the many factors that go to the "make-up" of a really good sheep.

(18). Now have the sheep turned up—look for sound mouth and teeth. Further examine the head and face. A broad square muzzle is most desirable.

(20). In and around the hocks the wool should be clean and free from excess blemish (brown).

(19). A really sound sheep should have a really sound belly covering.

(21). In male classes never fail to see that the animal is entire.

Insect Pests of Cabbages, Cauliflowers and Related Plants

By R. T. M. Pescott, M.Agr.Sc., F.R.E.S., Entomologist

IN his endeavour to grow clean vegetables, the vegetable grower is continually faced with the problem of controlling insect and mite pests which attack his crops. Growers for the interstate and export trade are vitally concerned with this problem.

While certain methods of control are available for all of these pests, it should be remembered that the thoroughness of application of any treatment is essential, not only individually, but on a district basis, if the maximum benefit from the applications is to be derived. There are several factors which are vital in the control of any insect pest attacking vegetables, and special attention should be given to the following:—

(1) Apparatus—make certain that the spray pump or dust blower are in good mechanical order when using and, after the application, thoroughly clean out for future use.

(2) Spraying—in spraying, the use of nozzles suited to the various kinds of sprays and various kinds of insects is important. In a general way, contact sprays, such as nicotine preparations, should be applied in a drenching manner with a coarse nozzle and with as high a pressure as possible. On the other hand, internal stomach poisons, such as arsenate of lead should be applied with a fine nozzle as a mist-like spray, with the nozzle held away from the plant. In this way, a thorough coating of the plant with poison will be obtained.

(3) Dusting—the chief points to be observed in dusting are—

(*a*) the dust must be very finely divided and not lumpy, and

(*b*) the duster must be capable of throwing a satisfactory light film of dust over the foliage.

Fig. 1.—Typical pea mite damage to the leaves of plants.

The following insects and mites are the most troublesome to cabbage and cauliflower growers:—

PESTS OF THE SEED-BED.

Pea Mite (*Penthaleus major Duges*) and Red Legged Earth Mite (*Halotydeus destructor Jack*).

Snails and slugs.

PESTS OF THE GROWING PLANTS.

Cabbage Moth (*Plutella maculipennis Curt.*)

Cabbage Butterfly (*Pieris rapae L.*).

Cabbage Aphis (*Brevicoryne brassicae L.*).

Cutworms (family *Noctuidae*).

Vegetable Weevil (*Listroderes costirostris Gyll.*).

PESTS OF THE SEED BED.

The Pea Mite and Red Legged Earth Mite.

Both of these mites, so commonly found on pastures containing clovers, are serious pests of seedling vegetables and other plants throughout Victoria. Where market gardens are concerned, while more numerous and destructive

on the sandy areas to the south and east of Melbourne, they are quite serious pests on the heavier types of soil also.

Type of Injury.—The mouth parts of these mites are developed more for rasping than for piercing. The surface of the leaf is broken and the sap sucked up. This results in a silvery or bleached area on the plant attacked (see Fig. 1), and where the mites are numerous and the bleached areas large, plants—particularly young ones—cannot stand up to the loss of sap and consequently die. Once the plant is growing strongly, however, the mites do not appear to do severe damage. In seedlings, the entire plant may be killed early, the result often being mistaken for frost injury. In some cases of damage, the white blemish is not so pronounced, but there is an actual dwarfing of the leaves and the whole plant, giving an appearance similar to the effect of drought.

Plants Attacked.—All types of young plants are attacked, particularly seedling vegetables.

Life History and Description.—During the summer, these mites are to be found in the form of eggs in the dead bodies of the parent mites on the surface of the soil. With the advent of rains and lower temperatures, these eggs hatch into small six-legged mites which immediately commence feeding on young plants. As the mites continue feeding, they become mature eight-legged mites, laying eggs chiefly on the under-surface of the leaves of the host plant, but some are laid on the ground. There are several generations of these mites in a season.

Fig. 2—The Red Legged Earth Mite (adult female).

Left.—Dorsal view. Right.—Ventral view. Magnified by 20.

The mature mite measures 1/25th of an inch in length. The body is of a dense velvety black colour, with eight bright red legs (see Fig. 2).

Control.—Measures for the control of these mites can be considered under two distinct headings:—

(*a*) Preventive, and (*b*) Chemical.

(*a*) *Preventive Measures.*—Preventive measures may be applied by growers of vegetable and garden plants. The smaller grower should not obtain seedlings from known infested gardens. This is an easy means of spreading the pest, as the eggs of the mite are laid on the leaves of these plants. The grower who raises his own seedlings should carefully prepare the seed bed and allow no growth of any kind on it for some weeks prior to sowing the seed.

(*b*) *Chemical Measures.*—For young plants in the seed bed, either spraying or dusting methods are applicable. For a spray, the most suitable mixture is 1 oz. of nicotine sulphate and 3 oz. of soap in 5 gallons of water. This should be thoroughly sprayed on to the plants and the soil under the plants. The warmest part of a reasonably warm day should be chosen for the treatment. It will be necessary to repeat applications every three or four days as long as mites are present. For dusting, a 2 per cent. nicotine dust or a prepared dust containing both nicotine and creosote are the most suitable. Recent experiments conducted in New South Wales have shown that a dust consisting of 1 lb. of derris-root powder, mixed with 8 lb. of a 2 per cent. nicotine dust, is very suitable for dusting young vegetable plants.

Snails and Slugs.

Snails and slugs are well-known pests of young seedlings, and may, in one night, destroy the whole of the plants in the seed bed.

Snails feed on weeds as well as on cultivated plants, and hence it is essential to remove all adjacent weed growth, as well as any accumulated rubbish or other shelter, prior to taking control measures.

Snail Control.—The most effective control for snails is a poison bait mixture consisting of 1 lb. calcium arsenate and 16 lb. of bran. These two materials should be thoroughly mixed while dry, and then made into a crumbly mash with 2 to 3 gallons of water. This bait is then scattered in a thin layer on the soil along the rows of affected plants and in other

situations where the snails congregate. The bait should be applied late in the afternoon or at night to ensure its being moist, as it is useless in a dry condition.

Slug Control.—The most effective control for slugs is a bait made from a compound known as metaldehyde. This is prepared as follows:—Powder two large tablets (8 grams) of Meta fuel and mix thoroughly into one quart measure of bran. Make this into a mashy bait by the addition of roughly one cup of water, and then broadcast it, or place it out in small heaps, some 2 feet apart, in the areas where the slugs are plentiful.

PESTS OF THE GROWING PLANTS.

The Cabbage Moth or Grub.

This is probably the most common pest that attacks growing cabbages and cauliflowers in Victoria.

In the early stages of attack, the young grubs either eat small patches from the under-sides of the leaves, or else they burrow in the leaves

Fig. 3.—Damage to cabbage head, caused by vegetable weevil caterpillars.

after the manner of leaf miners. They rapidly increase in size, however, becoming bright green, active caterpillars which eat large holes right through the leaves. The outer leaves of young plants are riddled freely, but as the plants become older and the outer leaves tougher, the

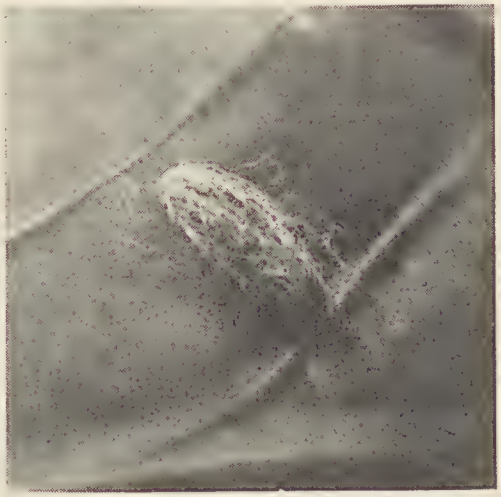


Fig. 4.—Cocoon of cabbage moth on leaf.

young grubs feed mainly on the more tender centre leaves (Fig. 3). When infestation is severe, the centre leaves become covered with a delicate webbing. In acute cases, the heart of a cabbage may become so riddled with holes and fouled with excrement that it is unfit for human consumption.

Plants Attacked. — Cabbages, cauliflowers, brussel-sprouts, turnips, radishes, stocks and wallflowers.

Description and Life History.—The adult cabbage moth is a very slender moth, greyish-brown in colour, measuring about five-eighths of an inch across the wings. There is a row of whitish marks along the upper margins of the folded wings, and because of this, is sometimes called the "diamond-back" moth. The eggs, which are minute and yellowish-white in colour, are laid singly on the under-surfaces of the leaves of the plants.

The grubs, when fully grown, are greenish in colour, measuring roughly one-third of an inch in length. They are very active, falling to the ground when the plant is disturbed. On reaching maturity, they spin a delicate lace-like cocoon, usually on the outer leaves or among the leaves of the heart (Fig. 4). The pupa is first green, soon changing to a dull brown.

The complete life history of this insect varies from three to eight weeks, so that in a season there may be many generations.

Control.—For the control of the cabbage grub, attacking cabbages and cauliflowers, arsenate of lead in one form or another is used.

If a spray is more convenient for use, the strength recommended is 2 oz. of arsenate of

lead powder and 1 oz. of calcium caseinate spreader to 4 gallons of water. If a dust is used—and this is the most common form in market garden practice—it should be preferably a 50 per cent. arsenate of lead dust.

The seed-beds should be treated twice a week with one or other of the above mixtures and, after planting out, the treatments should be continued every ten to fourteen days, or more frequently if infestation is severe. If the vegetables are required for interstate trade or export, where health regulations are in force, it will be necessary to cease the use of arsenate of lead approximately one month before cutting, and substitute it with a 2 per cent. nicotine dust to destroy young larvae.

In New South Wales and Queensland, derris preparations are extensively used against this insect, particularly in the dusts and sprays at the latter end of the growth of the vegetable. It is found that arsenate of lead is more efficient than derris in the early part of growth of the plant.

The Cabbage Butterfly.

This serious insect pest of cabbages and cauliflowers is comparatively new to vegetable growers in Victoria, being first recorded here in March, 1939. Since that time, it has spread over the greater part of this State and into southern New South Wales.

Fig. 5.—Damage caused by the cabbage butterfly caterpillars.

[U.S. Dept. Agri.

Nature of Injury.—The caterpillars of this pest commence work at the beginning of the season, damaging early plants. After riddling the outer leaves, they attack the tender inner leaves as they form, frequently feeding within the immature heads and rendering the cabbage unfit for food because of the abundance of their dark-green excreta. In cool weather the caterpillars often feed freely exposed on the surface

Fig. 6.—The cabbage butterfly—female.

of the leaves in the sunshine. Frequently they work into the centre of the cabbage, attacking the undeveloped "heart" and rendering the head worthless for market (Fig. 5). Seedling cabbages grown in cold frames are often damaged shortly after they are placed out in the field, the caterpillars cutting into the "bud," and thus destroying the future head. Injury of this nature may be serious, many plants being a complete loss.

Plants Attacked.—The cabbage butterfly caterpillars attack all vegetables of the cabbage family—cabbages and cauliflowers particularly, and, to a lesser extent, turnip, kale, radish, mustard and horse radish. Flowering plants such as stocks, and weeds such as charlock and shepherd's purse are also attacked.

Description and Life History.

Butterfly.—The butterfly is white, marked with black near the tips of the forewings, and has a wing spread of up to 2 inches. The female has two conspicuous spots on each forewing (Fig. 6), whereas the male has one only. The underside of the hindwing is of a uniform straw-yellow colour of satiny appearance, and in both sexes there is usually an indistinct black spot near its tip. The body of the female

Fig. 7.—Cabbage butterfly caterpillars on cabbage leaf.

[Britton and Lowry.

is whitish; that of the male is usually darker on the back. The male is smaller than the female.

Eggs.—The eggs are spindle-shaped, pale-yellow in colour, strongly ribbed, and are laid singly, usually on the underside of the outer leaves of cabbage and other plants.

Caterpillar.—The caterpillar is velvety-green in colour and very similar to the colour of the plant on which it is feeding. There is a faint yellow stripe down the middle of the back, and a row of yellow spots along each side in line with the breathing pores (Fig. 7). The surface of the body is somewhat rough and finely dotted with small black spots. It measures, when fully grown, about 1¼ inches in length.

Chrysalis.—When the caterpillar becomes fully grown, it attaches itself to a cabbage leaf or other nearby object by means of a thread-like girdle of silk, and then turns into the chrysalis which measures about ¾ inch long, varying in colour from dirty-grey to yellow, green, or dark-grey. The butterflies commonly fly to garden flowers sucking up nectar, or they may be seen hovering over the flowers. The butterfly is active by day, being on the wing from early morning to near dusk. It is a comparatively slow but tireless flier, capable of journeying long distances.

Control.—The experience of vegetable growers in Victoria with this pest has been that the arsenical sprays or dusts as applied for the cabbage moth or grub effect a very satisfactory control of this insect. It is therefore recommended that the normal arsenic sprays or dusts be used for the control of the Cabbage Butterfly in Victoria.

The Cabbage Aphis.

This insect pest rarely causes serious losses to cabbages and cauliflowers in this State, owing to adequate control measures taken, but if these are omitted from the spray or dust programme, serious damage will result.

Type of Injury.—The cabbage aphis causes direct injury to the plant by sucking sap, chiefly from the under surfaces of the advanced leaves (see Fig. 8), or from the young central leaves, causing serious distortion and prevention of growth. Where the crop is attacked in the field, and particularly during periods of warm,

Fig. 8.—Cabbage aphis on foliage of rape plant.

Fig. 9.—Severe wilting of rape plants due to cabbage aphis.

dry weather, serious wilting of the plants may result (see Fig. 9). If this is not corrected, individual plants may die.

Plants Attacked.—As far as our records show, only plants belonging to the same family as the cabbage and cauliflowers, namely, *Cruciferae,* are attacked. In addition to cabbage and cauliflower—turnip, radish, rape, kale, and Brussel-sprouts are attacked, while cabbages and cauliflowers grown especially for seed, frequently have the seed-heads severely damaged.

Description and Life History.—The aphids appear on the plants firstly as small clusters of greyish insects covered with a white mealy substance. They soon increase in numbers until the whole leaf and later the whole plant is covered.

Overwintering of this insect occurs in the form of eggs, which are to be found on decaying cabbage or cauliflower stems and leaves, or in the soil. These hatch in the early spring, and immediately attack young plants. With the production of winged forms of the aphids in late spring and early summer, infestation of plants further afield may result, distances of 1 mile being common for flight of these forms.

During the season, several generations may be passed before the production of the egg stage the following winter.

Control.—Control of this pest is readily accomplished in the early stages by dusting with a 2 per cent. nicotine dust (= 5 per cent. nicotine sulphate), or by using a combined arsenate of lead and nicotine dust in the ordinary cabbage moth dust. It is essential that these dusts be applied early, before the aphids have had time to multiply to large numbers.

Cutworms.

In certain seasons cutworms cause serious losses to market-garden and other crops. The 1938-39 season was particularly bad in this respect.

Nature of Injury.—Injury is caused by the grubs or larvae which normally are found in the soil during the day, but which come up on to the plants during the evening. They may attack the young plants in the seed-bed in the field immediately after planting-out, or again when the crop is maturing. In the early stages the plants are cut through at ground level causing them to fall over and die. In later stages, this type of injury is not so apparent, but damage to the foliage and hearts may result.

Plants Attacked.—Practically all economic plants are subject to attack, the chief being cereal crops, flax, maize, pastures, tobacco,

Fig. 10.—Typical cutworm larvae. (Enlarged). During the day they may be found coiled up in the soil.

tomatoes, potatoes, onions, market-garden crops, flowers, fruit trees, and young nursery stock.

Description and Life History.—Cutworm caterpillars (Fig. 10) are the larvae of night flying moths, which usually are found flying in early spring. These moths lay their eggs chiefly on moist soil under weeds and grasses, but in some cases, on the foliage itself. After a short incubation period the eggs hatch into small cutworms which feed, at first, on the young growths on any plants present. They shelter in the soil, just under the surface of the ground, during the day, coming up to feed at night. After four to six weeks of feeding, during which they moult or shed their skins some five or six times as they increase in size, they become fully grown, and are about 1 inch to 1½ inches in length, greyish to greyish-green or brown in colour, and generally possessing a "greasy" appearance. As many as 100 of these larvae have been found under a single potato or a young fruit tree in the nursery. When fully grown these cutworms pupate in the soil, later emerging as the adult moths, and the life cycle is then repeated. There are usually two broods in one season.

Control.—Of primary importance in the control of cutworms attacking any of the previously mentioned crops is the elimination of weed plants under which the spring eggs are deposited. Careful attention to this factor will, in great measure, minimize future losses.

The generally accepted method of controlling cutworms is the use of poison baits. These are prepared from the following formula :—

Bran	24 lb.
Paris Green	1 lb.
Water	3 gallons
Salt	8 oz.

It was discovered first in New South Wales, and it has been our experience in Victoria, that the addition of half a dozen crushed lemons to the above formula increases its effectiveness.

The bran and Paris Green should be thoroughly mixed together in a dry state, and then the water in which the salt and crushed lemon have been disolved, slowly added until a damp (not sloppy) mash is formed. If Paris Green is not obtainable, then arsenite of soda can be substituted, using 12 oz. of arsenite of soda for every 1 lb. of Paris Green in the original formula. It should be pointed out that this bait, however, is not as effective as the one containing Paris Green, and should be used only when Paris Green is not obtainable.

The bait should be scattered over the ground in the late afternoon, so as to be fresh and attractive to the cutworms when they emerge from the soil to feed in the early evening. It should be broadcast uniformly over an affected area in the case of a young crop, or spread along the rows of an affected crop, e.g., potatoes, tomatoes or onions. As a rough guide, about 100 lb. of prepared bait (containing approximately 45 lb. of dry bran) per acre is necessary for a single treatment. In cases where an infestation is abnormally severe, however, it may be necessary to considerably increase this quantity of bait per acre, or even to bait an area several times to obtain a satisfactory control. It should be remembered that this bait is poisonous, and should be handled by responsible persons only, and kept away from all animals.

The Vegetable Weevil.

The vegetable weevil, which is a native of Central America, attacks most vegetables.

Nature of Injury.—Damage to cabbages and cauliflowers by this insect is twofold. With the

Fig. 11.—Adult vegetable weevils.
[After *Essig*

young plants, the adult beetles frequently eat through the plants at ground level, causing damage similar to that caused by the cutworm. With more mature plants, the larvae or grub attacks the outer leaves and the heart, causing damage similar to that of the cabbage moth.

Description and Life History.—The adult weevils usually emerge in the late spring or early summer, from earthen cocoons in the soil. They are typical weevils, having a distinct snout or beak protruding from the front of the body. They measure about one-third of an inch in length and about half as wide, are greyish-brown in colour, with a well-defined V-shaped mark of lighter colour towards the extremity of the wing covers on the back (Fig. 11). These weevils are gregarious in habit, frequently collecting in large numbers around the stems of young plants, and also under boards or rubbish about infested areas.

Each female lays, on the average, some 500 eggs, either directly on the leaves, or on the soil near the base of the plant. The eggs are whitish when first laid, and about 1/25th of an inch in diameter.

Fig. 12.—Larva (right) and pupa (left) of the vegetable weevil. During the day the larva is found in the soil.

On hatching, the larvae or grubs are of the usual weevil form, being slender, strongly curved, legless, and a creamy-white colour when first hatched. They moult or shed their skins some four times before they become fully mature. They are then roughly one-third to one-half of an inch in length, and immediately leave the host plant, entering the soil to form their earthen cocoons before emerging as adult beetles (Fig. 12). The larval or grub stage usually occurs during the late autumn and winter months, and the plants most commonly attacked are turnips, beetroot, carrots, parsnips, cabbages and cauliflowers.

Control.—As with cutworms, the keeping down of weeds in the paddock during the late winter and spring, prior to planting, will assist greatly in reducing the population of these insects later.

In the field, as soon as the first signs of damage are noticed, the plants should be dusted with either a 25 per cent. lead arsenate dust or a 20 per cent. calcium arsenate dust, or else sprayed with lead arsenate, 1 lb. of powder in 16 gallons of water. One thorough application of either of these materials should be sufficient, but if subsequent damage is noticed, it may be necessary to repeat the treatment. It is always a wise precaution to dip young plants in the arsenate of lead solution before planting out, as this will keep cutworms in check as well as controlling the vegetable weevil.

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MANGE OR SCABIES OF PIGS—*Continued from page 104.*

On a clean well-kept piggery it should not be necessary to treat the surroundings, as the sunlight, fresh air, and mange dressing carried back to the pens on the pigs' skins will be all that is necessary. On badly-kept premises, thorough disinfection, combined with an improved standard of animal husbandry will be necessary.

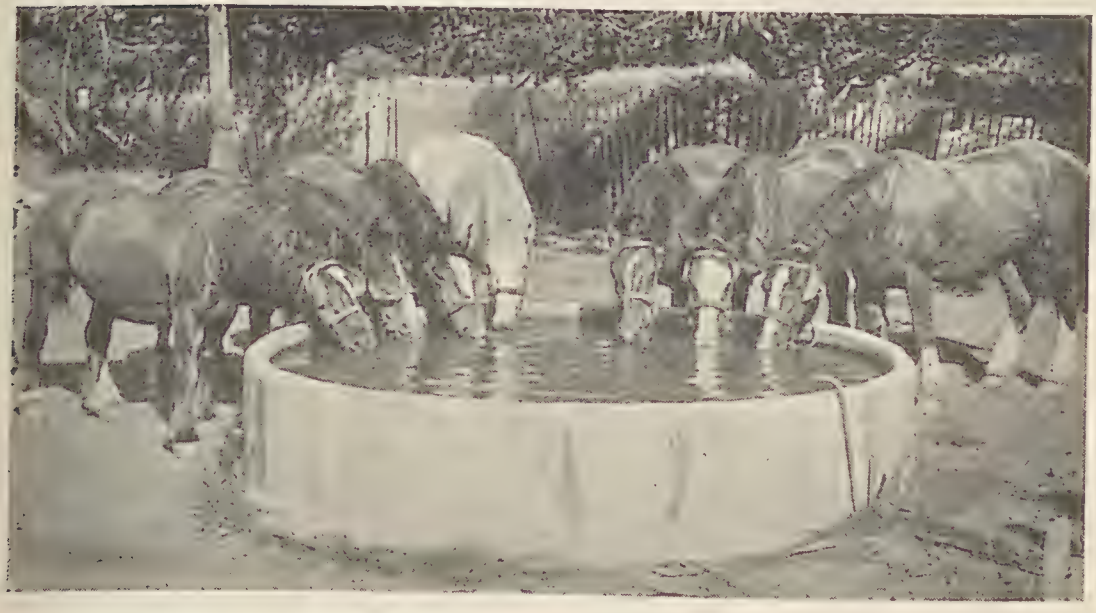
After the disease has *apparently been eradicated* it is a wise precaution to treat all sows prior to farrowing, and the suckers before weaning. This should be made a routine for at least six months after the herd has been regarded as clean, because the disease may be retained in the herd by an occasional animal with very small lesions.

In addition, a thorough examination of the herd in which early signs of infection are looked for should be made at regular intervals. Particular attention should be paid to the butt of the tail, feet, bridge of the nose, and inside the ears. This regular inspection should be made at intervals for at least six months. It is a good idea to select a fixed time to make this inspection, such as the first of the month, otherwise it may be forgotten.

Live Stock Notes

Reminders for March—April

Compiled by A. C. T. Hewitt, M.Agr.Sc., Live Stock Science Officer



Drinking Water for Stock.

THE importance of having an abundant supply of clean drinking water continuously available to all farm animals cannot be over-emphasized. Water is usually very cheap and abundant, and possibly this accounts for the casual attention it sometimes receives. As a horse requires about 10 gallons daily, a dairy cow about 15 gallons, pigs and sheep about 1½ gallons each, and poultry about 6 gallons per 100 hens, a large amount of water is required for the farm live stock. If the local supply fails, water carting is most expensive.

An ideal supply for the farm live stock is one obtained from a running stream, spring, bore, town supply, or dam, laid on to all paddocks, pens, and yards through a pipe system to troughs for cattle, sheep, and horses, or automatic waterers for pigs and poultry. The storage should be fenced off from the stock to prevent them churning up the mud and putrifying the water, and should be large enough to carry through the driest seasons.

In proportion to their size, milking cows require a large amount of water. This is mainly because milk contains 87½ per cent. of moisture. Any shortage in the water supply is reflected by a drop in milk yields. A milking cow may drink from 5 to 40 gallons of water daily, the quantity depending upon her size, the amount of milk she is giving, the temperature and humidity of the atmosphere, and the amount of moisture in the food. Variations in the water requirements of other animals also occur.

Dry stock may thrive for months in cool weather on succulent pasture grazed while wet with dew without actually drinking any additional water. But when there is a water shortage, the feed is usually dry and there are practically no dews. When fed large quantities of skim milk, whey, or butter-milk, pigs may receive sufficient moisture in the feed. However, even under these special circumstances, it is advisable to have clear drinking water continuously available.

A fresh clean water supply. Note fencing to keep stock from puddling and contaminating the water.

Stock usually drink several times during the day and, for this reason, water should be available to them at all times. The water and the feed should always be situated close together and, in times of drought, the stock should be given all supplementary feed in close proximity to water. This avoids the loss of energy expended in travelling between the feed and the water.

Generally, stock should be allowed to drink as much water as they desire. With working horses, however, it is advisable that they be watered before being fed.

Water is used by farm animals for numerous functions. The body of the animal is more than half water. The blood and all other fluids and secretions in the body contain about 90 per cent. of water, while cows' milk contains about 87½ per cent. Water is necessary to soften and moisten the food for its passage through the alimentary canal. Digestion only takes place when moisture is present, and in it the digested food is dissolved and absorbed into the blood stream. Water is used to convey all the materials required by the body from one organ to another, and in it all the waste products are dissolved before being excreted.

Water is used also to regulate body temperature through the physiological function of perspiration or sweating. Food is eaten to develop heat and water is evaporated from the lungs and pores of the skin to prevent the heat rising above a certain temperature, ranging between 98 deg. F. and 104 deg. F. according to the species.

The purity of the water supply is of importance since water may contain parasitic larvae, disease germs, organic matter, or excess minerals. Running water and water from springs, bores, and large fenced dams is usually free of parasitic larvae, disease germs, and excess organic matter, but may contain too much mineral. Water containing up to 400 parts of mineral salts per 100,000 parts is usually quite safe for drinking purposes, although for heavy milking cows, the water should not contain more than about 200 parts per 100,000.

Stagnant water often contains many parasitic larvae, disease germs, and much harmful organic matter. When such water has to be used, lime should be thrown into the dam or waterhole to precipitate most of the organic matter and cleanse the water. At the first opportunity, the dam or water hole should be cleaned out. If possible, when cleaning out a dam it is advisable to remove all silt and leave bare clay exposed all over the sides and bottom. Vegetation usually takes a long time to grow on a bare clay surface.

Dams and waterholes are usually contaminated with parasites when stock have free access to them. Animals become re-infested with these parasites when they drink the water and graze the weeds growing round the edges. In the control of parasitic diseases it is essential that all dams and waterholes be fenced off from the stock, which should be watered from troughs. Parasitic diseases are particularly prevalent amongst sheep and young cattle.

Where it is not possible to gravitate the water to the drinking troughs a windmill or engine and pump are required.

All troughs and automatic waterers should be regularly cleaned to maintain the purity of the drinking supply.

Dairy Cattle.

Dairy farmers should check their fodder reserves and the number of cattle on hand and consider disposing of all culls and cattle not required next season. No more cattle should be carried through the winter months than can be adequately fed. On no account is it profitable to feed culls in the hope of fattening

them for sale if feed has to be bought for the purpose, or if the milkers, dry cows, and growing stock have to go without.

The herd that is well fed and not allowed to get down in condition during the winter months will milk better not only during the winter, but also in the following spring and summer. Next season's culls also will be in better condition and realize more for beef when eliminated from the herd.

In a herd that is neglected during the winter, due to overstocking or underfeeding, the winter production will be low, some cows may die, especially those near calving, while those that calve safely will have to gain strength and condition during the spring before they can produce their best yields. By this time the spring will be over, and with the approaching hot weather the tendency will be for the cows to drop back in production.

The herd should be adjusted now for the approaching winter in accordance with the carrying capacity of the farm and the fodder on hand, or the fodder that it is intended to buy.

Beef Export Restrictions.

The export restrictions recently imposed by the Australian Meat Board, following the shortage of shipping space, are expected to reflect more on the dairying industry than the beef industry, since they apply to all boneless bull beef, all boneless second and third quality cow beef, and all boneless veal, in addition to all boneless beef briskets, shins, and shanks, all beef offal except livers and kidneys, and all veal offal. However, in Victoria, any drop in the price of culls from the dairy herd will represent only a small amount in comparison with any reduction in the cream cheques as the result of overstocking or underfeeding. For this reason it is recommended that culled dairy stock be marketed as usual. In Victoria, good meaty dairy cows are extensively used in the local beef trade, and this outlet still remains open.

Sheep.

Owing to the difficulty of providing sufficient insulated ships to carry the full quantity of meat which is available here for export to the United Kingdom, the Australian Meat Board has announced that the following classes of mutton and lamb are not being accepted for export:—

Mutton and lamb offal, excluding mutton and lamb livers and mutton kidneys.
Lamb and first and second quality under 23 lb.
First and second quality lamb over 42 lb.
Third quality lamb over 28 lb.
Piece lamb.
Second quality wether mutton.

These additional restrictions are not expected to seriously affect the sheep industry, because most of the rejected meat will be absorbed by the local market. But they clearly indicate that breeders should concentrate on producing good quality lambs weighing about 30 lb. frozen dressed weight (65-70 lb. alive on the farm), and good quality wether and maiden ewe mutton. The production of these classes of lamb and mutton has always been advised by officers of the Department of Agriculture.

Pigs.

Marketing.

Victorian pig markets have been somewhat irregular, with a downward tendency during the last few months. However, observations at many pig markets show that whatever the state of the market there is always a big margin between the price per pound of prime pigs and inferior pigs. This margin is sometimes 1d. per lb., which is 10s. per head on 120-lb. pigs. The differences between prime and inferior pigs come under several headings.

Weight Range.

There is little demand for porker pigs, whereas the demand for baconers from 120 lb. to 160 lb. dressed weights has been comparatively good in recent weeks provided the pigs within this weight range are good in other respects.

Condition.

Over-fat pigs are making lower prices per lb. than those pigs which are finished and marketed in hard prime condition. Growers should seek the advice of pig buyers on the degree of finish of their pigs.

Pigs of either porker or baconer weights which are in low condition are sold only at a considerable discount as they are in over-supply at present. If it pays feeders to buy these pigs and carry them on to prime condition there

should be some profit in them for their breeders to carry them on to baconer weight and condition.

Conformation.

Long-bodied pigs are more sought after than short-bodied pigs, and even though plump hams and light shoulders are also desirable features, body length should not be sacrificed in securing them. Short, thick breeding stock should be culled, and young pigs which show a tendency to thicken at baconer weights should be fed somewhat limited diets during their finishing stage and marketed at light bacon weights.

Quality.

A pig should have clean skin, free from scale, mange, and wrinkles if he is to bring top price per lb. This condition can be obtained by breeding from smooth-skinned pigs, by keeping pigs in clean conditions providing plenty of shade, and oiling to control skin parasites such as lice and mange mites. [L. A. Downey, H. D. A., Pig Expert.]

Poultry.

Egg-Laying Competitions.

Revolutionary changes have been going on in the poultry industry for some years past, and now little attention is being given to the purely "fancy" or exhibition breeds, and most fowls are bred for their ability to produce economically eggs and meat for human consumption.

Egg-laying competitions have done more to draw attention to the potentialities of commercial egg production than any other single factor, and they have become a recognized and essential part in the building of the poultry industry in most parts of the world. The results obtained in these competitions have shown that they can have a definite influence in assisting to establish stock of the most desirable quality on commercial poultry farms, and they therefore render a very distinct service to the industry. At the present time competitions are being conducted in all States of the Commonwealth.

The Burnley Egg-Laying Competition, conducted by the Department of Agriculture, commences on the 1st April each year, and extends for 48 weeks. Two sections are provided, as follow:—

Section A—for teams of six birds, trap-nested; and

Section B—for individual birds, each housed in a single pen.

Prize certificates and sashes are awarded, and the competition is decided on the greatest number of first-grade eggs laid by the birds in the various classes of each section.

The Thirtieth Egg-Laying Competition concludes on the 2nd March, and the next competition commences on the 1st April.

As a rule there is no shortage of competitors to fill all available pens—the maximum capacity is 656 birds—but any one desirous of entering birds in the competition should get

A section of the crowd attending the Poultry-farmers Field Day at Burnley on 1st February.

in touch immediately with the Superintendent of Live Stock, Department of Agriculture, Melbourne, C.2. [H. F. Clinton, Poultry Expert.]

Horses.

The Bot Fly or Horse Bee, as it is often called, is known to cause considerable loss to horse-owners in most parts of the world. In North America, Great Britain, Europe, and Asia, as well as in Australia, serious efforts are being made to control the ravages of this pest.

Bots may cause injury in one of the following ways:—

(1) By the fly, during the process of egg-laying, annoying the horse while at pasture or at work.

(2) In the larval stage, by the withdrawal of nutriment from both the stomach and its contents.

(3) By the actual obstruction of the passage of food from the stomach to the intestines, especially when the larvae are collected in numbers about the pylorus or exit door to the stomach.

(4) By injury and irritation to the mucous membrane lining the stomach, due to the penetration of the hooklets by which the larvae are attached.

(5) By irritation, injury and possible penetration of the intestines, rectum and anus, in the passage of the larvae from the horse.

If the stomach or intestinal walls are penetrated by the bots, peritonitis often is set up, and this generally causes the death of the horse. It should be remembered, however, that it is really seldom bots actually cause death. Because a post-mortem examination on a dead horse shows the presence of bots, they should not necessarily be blamed for the death unless they have penetrated the stomach or intestinal wall causing peritonitis or have actually caused a stoppage of the bowel.

The eggs are pale yellow in colour, and are attached by their lower third to the horse's hairs. They do not hatch out until they have been licked by the animal. The moisture and friction of the horse's lips causes each egg to open when a tiny larva or maggot emerges. From the lips this little maggot works its way into the mouth, and burrows into the muscles under the tongue. It remains in this position for three or four weeks before it is swallowed and becomes attached to the walls of the stomach or the first few inches of intestines. In three or four months the bots reach their full size, and are passed out on to the ground where they burrow, and in two to four weeks emerge as mature flies ready to lay more eggs.

The eggs may be removed from the horse's coat by rubbing vigorously with a 2 per cent. lysol solution, the friction and moisture hatching the eggs, and the small larvae are then destroyed by the disinfectant. Horses heavily infested with eggs are best treated by clipping and burning the hair, thus destroying the eggs.

To remove the bots from the stomach, the following treatment is advised:—Feed the horse for two days on bran mashes, then fast for twelve hours. The horse should then be given a ball containing carbon disulphide. The dose of this drug is 6 drachms for a horse of about 1,000 lb. weight. No food or water should be given for at least four hours, and on no account should the dose be followed by a purgative; oil especially is dangerous.

It is inadvisable to give a purgative before dosing, and great care must be taken when balling the horse, as should the capsule break in his mouth and the drug get into his lungs, serious consequences may ensue.

Young and small horses should receive proportionately smaller doses, while very old or debilitated animals should be looked upon as risky cases for treatment.

Bots may be passed for two to three weeks after treatment, individual horses being known to evacuate 500 or more, while in extreme cases 1,000 have been found in the abdominal contents. [W. D. Shew, G.M.V.C., B.V.Sc., Senior Veterinary Inspector.]

Bees.

In all districts where the autumn honey flow will be light, less comb should be extracted than usual because the bees will require larger reserves of honey to carry them through the winter.

The apiarist should take advantage of the time thus saved and overhaul all hives and plant. Where pollen supplies are good, the time is opportune to replace all old and unsatisfactory queens. To do this it is necessary to make sure that young queen cells from which to rear new queens are still being produced in hives of a good strain.

When given sufficient room hives which have a new autumn-raised queen rarely swarm during the following spring, and this assists in

[Continued on page 137.

"Bearing Trouble" in Ewes

By A. R. GRAYSON, B.V.Sc., Veterinary Officer

"BEARING trouble" or, more correctly, eversion of the vagina, is a condition which occurs, to some extent, almost every year, but which is much more common in mild seasons in which the late summer and autumn rainfall is in excess of the average. Such conditions prevailed in most parts of Victoria in the autumn of 1939 when the resultant growth of pasture was tremendous.

The condition is noticed usually within fourteen days of the time when the ewe is due to lamb. The protrusion of the membrane lining the vaginal passage from the vaginal orifice, in the form of a large reddish swelling, is the first sign. The ewe becomes listless and uneasy, grazes little and tends to separate from the flock.

The swelling increases with time, both from the frequent and continued straining on the part of the ewe in attempting to urinate, and from the accumulation of blood in the extruded part. If untreated, inflammation of the extruded part occurs and this in addition to the inability to urinate, results in the death of the ewe.

On post-mortem examination there is found to be a great amount of abdominal fat, the liver is pale and fatty, and the urinary bladder is enormously distended. Often twin lambs are being carried.

The vast majority of affected ewes are 4-tooths and upward, the condition being rare in 2-tooths.

Treatment.

If the ewe can be treated before the extruded part has become congested, injured or filthy, a good percentage of recoveries can be obtained.

The part should be thoroughly cleansed, using a mild, luke-warm disinfectant solution, lysol or dettol, 1 tablespoonful to 1 gallon of water, or permanganate of potash (Condy's crystals) ½ teaspoonful to 1 gallon (freshly prepared daily) are suitable disinfectants. Strong or irritant antiseptic solutions must be avoided as the resultant irritation will cause straining.

Having thorougly cleansed the part, smear it with vaseline, or some similar preparation and return it to the normal position, keeping it in place with the hand until it becomes warm due to the circulation of the blood. It is, of course, essential that before doing so the hand and forearm of the operator also should be thoroughly cleansed. Raising the hindquarters of the ewe during the above operation will materially assist. When the operation is completed, two or three locks of wool should be tied tightly across the vulva to help keep the membrane in position. In cases of a relapse of the trouble the insertion of stitches will be necessary. In such a case it is advisable to insert the stitches in the skin on each side of the passage and not through the lips of the vulva. It is not advisable to insert objects such as small bottles, short sticks, &c. into the vagina in order to retain the bearing mechanically. These are of little value for that purpose and may cause serious injury to the ewe.

Causes.

The seasonal conditions which predispose toward the incidence of the condition are, as already indicated—mild weather, excess rainfall and rank, lush growth.

As a result the ewes are carrying too much condition, and if rarely disturbed they lie down for long periods to ruminate. The womb is pregnant, and associated with the fatty condition of the ewe is a lack of tone of the muscular system. During the periods when the ewe is lying down the bladder fills with urine. She gets up to urinate when the bladder is full and to pass water she has to strain. In doing so she contracts the abdominal muscles and forces the organs—intestines, womb, &c. back into the pelvis. This causes the neck of the bladder to become closed by the pressure and a "vicious circle" develops—the more the ewe strains the more effectively is the neck of the bladder closed and the longer the bladder is closed, the greater is the straining to make water. Eventually the vagina is prolapsed to the exterior.

Prevention and Control.

Prevention is on common sense lines. The ewes should be in good, but not fat, condition when joined. Where the feed is plentiful and the ewes appear lazy, they should be mustered *quietly* once daily and given a change of pasture and gentle exercise for one to two hours. This exercise, in itself, will greatly reduce the incidence of the condition.

THE NORTHCOTE CHILDREN'S FARM

A Valuable Training Centre

By V. C. G. LEWIS

IN England some years ago a motion picture was screened depicting the work and emphasizing the aims of the Fairbridge Farm School at Pinjarra, in Western Australia. The film created unusual interest in London, portraying vividly the valuable work being done at the school for children from distressed British homes, and indeed for children who formerly had no home at all. In one of the many audiences witnessing this picture was Lady Northcote, wife of a former Australian Governor-General.

This lady was deeply moved by what was being done at Pinjarra, for children taken from a squalid unhealthy environment. The ideal conditions for work, play, and training at the Fairbridge School so impressed her that she made provision in her will for the establishment in Victoria of a farm school for poor and orphaned British children to be conducted on lines similar to those on which the Fairbridge Farm School was run.

After her death, in June, 1934, Lady Northcote's instructions were given effect to insofar as the formation of a trust fund was concerned. The difficulty, however, was to obtain land suitable for the purpose she had had in mind, and some delay occurred in establishing the project, but this difficulty was overcome in June, 1936, when Sir William Angliss made a generous gift to the trustees of an area of 3,000 acres of land at Glenmore, some 11 miles from Bacchus Marsh. Preparatory work was commenced at once, and the first party of children numbering 28—all boys—arrived at the farm on the 28th July, 1937. The first party of girls did not arrive until the following year.

Since establishment, steady progress has been made, and at present 156 children—116 boys and 40 girls—are living at the farm.

Each cottage is identical in construction but varies in regard to furniture, furnishings and colour.

The farm "village" is a complete settlement in itself, consisting of the home of the principal (Lieut.-Colonel S. J. Heath), the children's cottages, a hospital with eight beds, a communal dining hall, gymnasium, steam laundry, electric power-plant, boot-mending shop, and offices. It is sewered, supplied with electricity for power and lighting purposes, has its own water supply, swimming pool, children's playground, and sports oval. In addition, the settlement is liberally provided with excellent metal roads. The flourishing condition of the gardens and lawns in the present dry season gives evidence of the abundant water supply and the industry of the village staff and children.

Until they reach the age of fourteen years the children are accommodated in the village cottages. A "Cottage Mother," specially chosen for qualities of temperament and disposition, is provided for each cottage, and tends the fourteen children entrusted to her care. At present two of the twelve cottages are not used to accommodate children, as none have been brought from Britain since two

The boys assist in cutting firewood required at the farm.

weeks prior to the outbreak of war. However, immediately on the cessation of hostilities a large influx of children to the farm is anticipated, and the trustees are proceeding with the development of the farm with this prospect in view.

Each cottage is identical in construction, but varies in regard to furniture, furnishings, and colour. Hot and cold water, electricity, and sewerage are provided. There is a living room, approximately 30 x 20 feet, a well-fitted kitchen, large airy dormitory, children's bathroom and lavatory, a room for children needing special care, and the Cottage Mother's quarters with bathroom attached.

The children's bathroom leads off the front verandah, to permit the children to remove their outdoor shoes, wash themselves, and put on their house shoes before entering the cottage. Every morning the children have a cold shower, and at night a warm bath.

The Cottage Mother attends generally to the needs of her charges, even to cutting their hair, and their appearance of health and well-being reflects credit on both their adopted mother and the farm school, which has become a real home to them. They behave courteously and naturally in the presence of visitors, with no suggestion that they are on their best behaviour for the occasion. The relationship between children and cottage mother obviously is one of affection and respect. An atmosphere of home in the best sense of the word is conveyed quite unmistakably to the visitor. There is no repression, nothing of the "institution" about the place, and the children, with their bright and intelligent bearing, might have come from good, middle-class Australian homes.

Breakfast and dinner are taken at the large communal dining room in the centre of the settlement, and tea at the cottages.

Adjacent to the farm, the Education Department has provided a large new State school with a staff of five teachers to attend to the educational needs of the children, who are able to return to the farm for their midday meal.

At the age of fourteen the children leave school and commence farm and domestic training duties.

The training farm is situated across the main road from the settlement, and is under the management of Mr. J. N. Hancock, who resides at the old Glenmore homestead. Many of the original farm buildings, nearly a century old, are still standing, and in good condition. The homestead itself is of more recent construction, and stands in the midst of an excellently tended, old-world garden. One magnificent oak bears a brass plate, to the effect that it was planted in 1839 by Mr. Griffiths who, with a Mr. Grieve, was the original joint owner of the property. The present garden was planned by the late W. R. Guilfoyle, who succeeded Baron von Mueller as curator of the Melbourne Botanical Gardens in 1873.

On leaving school the boys are moved to the trainee quarters, "Birredool," a large cottage just across the road from the farm homestead, and are cared for by Mr. and Mrs. Millward. Birredool is very similar in lay-out to the cottages, but is larger, has a library, locker accommodation, and wireless set.

Each of the boys receives a good working knowledge of all branches of farm work. A system is operative whereby no boy shall be kept on one job longer than a fortnight at a time. For example, a boy who works two weeks in the dairy would serve two weeks attending to the poultry, pigs, garden, and so on. All work is done under the supervision of experienced instructors.

The dairy buildings are modern, well-constructed and airy. The cowyard, approaches and buildings are paved with well-graded concrete.

The dairying unit is supervised by Mr. L. Graham, an experienced dairy farmer, and is one of the farm's most important and lucrative activities. Between 80 and 100 cows are milked throughout the year, the work being done by the boys and Mr. Graham.

A Jersey herd of 30 head has been formed, and is being further developed. The nucleus of this herd was created by gifts from various well-known citizens.

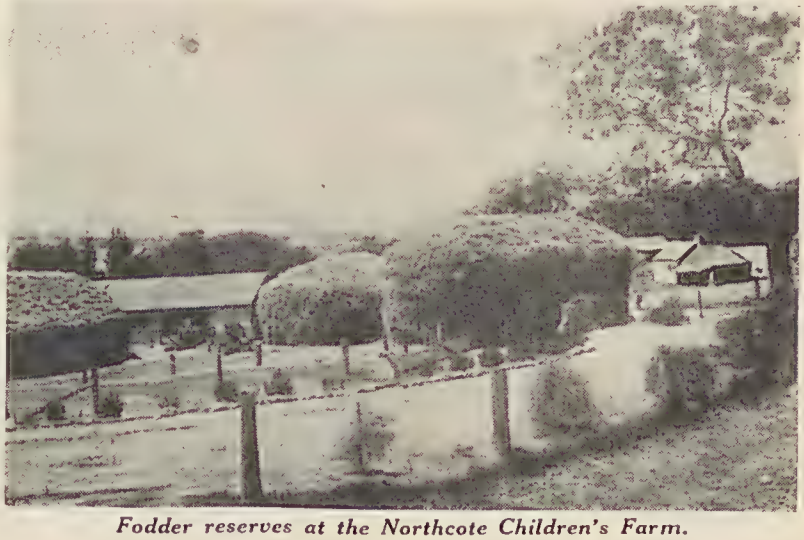
The dairy buildings are modern, well constructed, and airy. These buildings, together with the cowyard and approaches have been paved with well-graded concrete. After each milking the sheds and yards are hosed, swept, and maintained in a scrupulously clean state. The bails are of metal piping, and this and also the milking machine pipe lines are polished and kept free from dust and dirt.

The separator room is kept in a similar state of cleanliness, while all the utensils after use are sterilized by steam in the wash room adjoining.

The detached cream room is constructed of fibro-cement sheets on a 6-in. concrete dwarf wall, with a large overhanging iron roof, and an inner ceiling of cement sheeting. There is a 6-in. flywire-covered opening around the top and bottom of the walls, and a flue opening in the ceiling for the escape of heated air, which assists in keeping the small structure comparatively cool in hot weather.

The cowyard is circular in shape, with a concrete water trough set into one panel, and was designed by Mr. Graham, who also did the concreting of the sheds and yards.

An emergency water supply is provided by a windmill, which is kept running all the time, and when the 3,000-gallon tank is filled the overflow is carried across the main road into a large dam. This dam provides a further emergency water supply, ensuring an abundance of water to the dairy at all times.



Fodder reserves at the Northcote Children's Farm.

Manure from the cowyard, farmyard, poultry, and pig pens is collected regularly and used on the farm, resulting in improved fertility and a reduced artificial manure account.

Fodder conservation has been given proper attention. Large quantities of meadow hay and lucerne are cut and baled annually. Last year 11,000 bales of lucerne and pasture grasses were conserved despite the dry season.

Barley, wheat, and oats are grown, the oaten hay being stacked for use on the farm. All chaff required on the farm is cut by the boys under supervision. There is no irrigation, but two creeks supply the farm with a reliable flow of water, in addition to that artificially conserved.

Colac rye grass does particularly well on this country, and 100 acres of this strain have been sown down. It is proposed to increase this area as opportunity permits. Pastures are top-dressed annually at the rate of 90 lb. superphosphate per acre.

Last season the crops sown on the farm did very well considering the dry year, and the manager, Mr. Hancock, attributes this in large measure to leaving the surface soil lumpy after fallowing, instead of breaking it up by harrowing or rolling.

Last year 4,000 sheep were shorn, the boys doing most of the shed work, picking up, and pressing, and also at the table with an employee supervising.

An interesting feature of the farm is a hill, known as White Elephant, situated on the property. This hill consists chiefly of stone outcrops and barren spurs. It grows practically nothing except a few trees and a coarse grass known as "silver tussock." Yet, 400 to 500 wethers are said to do well on this land all the year round. One-half of the tussock area is burned every two years, providing a burned section each year. This elimination of coarse growth evidently allows sheep to obtain sufficient nourishment to keep them in good condition.

Twelve sheep are killed weekly by the boys, who also do the skinning and maintain the meat house in a sanitary condition.

Approximately 400 head of poultry—Black Orpington and White Leghorn—are kept, and all eggs required by the village and farm staff are obtained from this source.

The pig unit is extensive, and the boys obtain here a good insight into the work of pig management.

The farm garden is supplied with an ample manure and water supply, a large variety of vegetables being grown, sufficient to provide the needs of the settlement for most of the year. A young orchard of 6 acres adjoins the vegetable garden, and it is proposed to increase this area as time progresses.

Four hacks are provided for the use of all the children at the farm, and it is the aim of the management to turn out each child at the conclusion of training as a capable horseman or horsewoman.

The boys are taught to drive a team, motor truck, and tractor, and attend to minor mechanical defects. All boys are taught fire drill, both for bush and settlement fires.

Up to the present, sixteen boys have gone to outside employment as farm labourers, and in every case good reports have come to hand from their employers.

The girls are taught domestic duties on leaving school, and are employed on the various domestic tasks at the village and on the farm. At the age of sixteen years they go to outside employment. They are taught to do their own mending, and it is proposed later to establish a sewing school at the settlement.

The farm hospital is a well-constructed building, containing two wards with four beds to each, and the quarters of the sister in charge. The beds were donated by public-spirited citizens and public bodies. The local doctor attends as required.

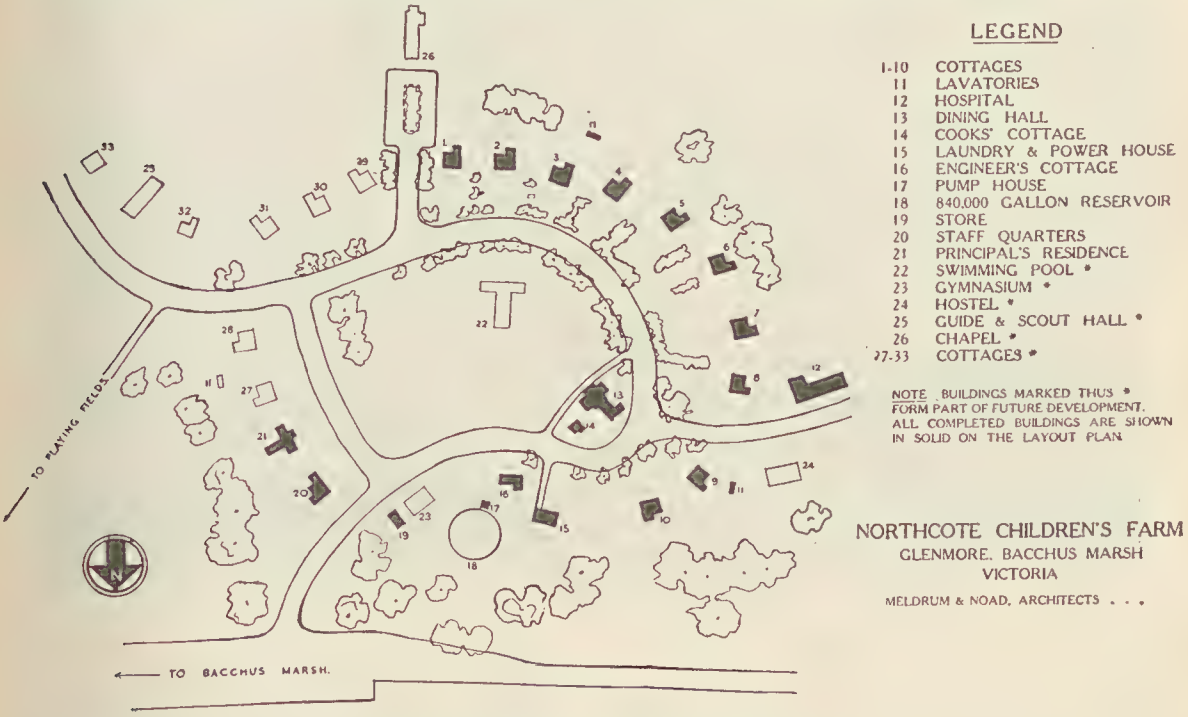
It is the aim of the trustees and farm management to train all children so that when

The boys ride, drive, and become accustomed to the handling of horses.

they leave the farm school they may take their place among their Australian fellow citizens with mutual confidence and respect.

They are taught, not only to do a job, but to know why it is being done, and a marked development in their initiative has resulted.

All the girls are either Brownies or Girl Guides, and the boys Cubs or Boy Scouts. Chosen members attend guide and scout rallies in different parts of the State, and in this way obtain an insight into conditions outside their immediate farm school environment.



Plan of the village, Northcote Children's Farm.

LIVE STOCK NOTES—*Continued from page 131.*

controlling swarming. Autumn re-queening enables a strong force of young bees to be built up in the hive during the winter, and lays the foundation of a good hive for the following season.

It must be remembered that honey produced in the autumn has a poorer density than that produced in the dry hot summer weather. Therefore the combs should be more fully sealed before extraction. The bees also should be allowed to store a considerable amount of honey in the brood nest to ensure well-ripened stores. The relative density or ripeness of the honey is to some extent indicated by the number of cells sealed on the face of the comb.

Beeswax.

Many apiarists are temporarily finding some difficulty in disposing of sufficient honey for immediate financial requirements.

Fortunately the position in regard to beeswax is entirely different, as the market recently has been able to absorb all the beeswax offering, at prices ranging from 1s. 10d. to 2s. 3d. per lb.

In normal times, with beeswax at 1s. to 1s. 3d. per lb., much of this product is allowed to go to waste, or is used as fuel with the refuse, but to-day it is profitable to save all scraps of wax throughout the apiary. A maximum effort should be made to get all the beeswax obtainable from old combs and cappings refuse before condemning it to the scrap heap.

The efficient use of a wax press will secure a far greater output of wax than is at present obtained by many apiarists, and an article dealing with this phase of the work will be published in a subsequent issue of this Journal. [J. S. Eagland and J. W. Thomlinson, Apiary Inspectors.]

By J. L. Provan, B.Agr.Sc., Senior Horticultural Instructor.

Orchard Notes.

ALL growers who cool store apples have experienced more or less severe losses from various diseases and disorders. The Jonathan is a poor storage variety, and generally should not be kept in store after the end of September. One of the chief troubles which affects the Jonathan in store is *Soft Scald.* This is a disorder which is found to occur in Jonathan apples picked when at their prime (i.e., when the ground colour is green-yellow), and stored at too low a temperature. Fruit picked immature or over-mature is not susceptible to *Soft Scald.* The remedy for overcoming this form of scald, however, is not to adopt the practice of picking immature or over-mature fruit, but to take particular care of the storage temperatures. Jonathans should be picked when the ground colour becomes green-yellow, for it is at this stage that the fruit will have maximum quality combined with a reasonable expectation of storage life. The storage temperature until the end of April should be 36° F., and then reduced to 34° F. till the end of May, and then still further reduced to 32° F. until the fruit is removed from store.

This season, two factors are worthy of consideration. The first is that the season appears to be at least two to three weeks earlier than usual, and therefore, unless growers are fully aware of this fact, there is the tendency that fruit picked towards the end of the harvest will be over-mature and therefore will have a very short storage life, and will not have its maximum quality in the post-storage period. Mealiness and early breakdown characterize this type of fruit on removal from store. The object of producing fruit is to supply the needs of the community, but the consumer will only be induced to increase his consumption if the fruit is sufficiently attractive. The large crop of good quality fruit which is at present on the trees will not retain this quality until it reaches the consumer unless the grower harvests it at the correct stage of maturity, and stores it at the optimum temperatures. It should be remembered that delays between harvesting and storage are detrimental to the keeping quality of the fruit.

The maintenance of soil fertility in the orchard is a constant problem for the Victorian grower. At this time of the year, his attention is directed to the sowing of green manure crops

in an endeavor to maintain or increase the soil fertility. In addition to the maintenance of fertility, the green manure crop has a very marked effect on the physical texture of soil. Constant clean cultivation causes a rapid deterioration in its physical structure, the soil becomes harsh or cloddy, rather impervious to moisture, and difficult to cultivate.

Barley cover crop in a Northern pear orchard.

Many growers are deterred from the practice of green manuring because, in the past, they have endeavoured to establish one of the green manure crops and have had no success. Investigations in various parts of the State have shown that leguminous crops cannot be established on some soils while they are in their present condition. These soils, which are hungry, acid soils of loose texture, may be improved by the sowing of cereals such as barley or rye corn. Marked responses have been obtained with dressings of 2 cwt. of sulphate of ammonia and 2 cwt. of superphosphate applied at the time of sowing. This fertilizer application is not excessive when it is remembered that such soils are of very low fertility and growth of cereals without fertilizers is very small. In the slightly more fertile soils, a mixture of barley and peas or barley and tares can be used, and this mixture, together with an application of 2 cwt. of sulphate of ammonia, yields quite a good bulk of green manure for ploughing under in the spring. In the loose hungry soils, very good results have been obtained by some form of organic manuring. Poultry manure, farm-yard manure when obtainable, and blood manure have all shown a marked effect on the growth of the green manure crop. Districts where this organic manure has been used successfully as a fertilizer are Harcourt, Pomonal, and Upper Pakenham. If good bulk of green manure is desired it should be sown early this month, and if water is available, one or two irrigations should be applied, according to the weather conditions.

In some districts legumes have been difficult to establish because of the presence of Pea Mite. Where this occurs, a cereal crop, together with an application of 2 cwt. of sulphate of ammonia should be adopted for several seasons, and then the return to legumes can be made.

In the more fertile soils, particularly in the Goulburn Valley and the northern districts of the State, tick beans can be established without much difficulty. This crop is one of the bulkiest and best to grow.

Growers who cannot sow a cover-crop should apply a light dressing of 2 : 1 or 2 : 2 sulphate of ammonia and superphosphate to the lands, at the rate of 2 to 3 cwt. per acre, in order to stimulate the growth of natural herbage, particularly on soils which remain bare during the winter and early spring.

Garden Notes

By A. W. Jessep, M.Agr.Sc., B.Sc., Dip. Ed., Principal, School of Horticulture, Burnley.

AFTER the heavy rainfall in February, the soil is now in good condition to commence preparations for the planting of winter annuals. Plant out seedlings of Iceland poppy, calendula, stock, antirrhinum, pansy, viola, winter-flowering sweet pea, cineraria, and dianthus. Plant any of the following perennials:—Bearded iris, gladiolus, daffodil, crocus, freesia, ixia, lachenalia, sparaxis, and some of the earlier flowering lilies.

Roses and delphiniums should be dusted with sulphur if they show any sign of mildew. Select a warm day after a dewy night, so that

the sulphur will stick to the leaves and then form gas as the day warms up. It is the gas from the sulphur that destroys the fungus of mildew. The dahlias should be at their best this month, and if the flowers are kept well picked, the plants should continue to bloom until the first frost cuts them back. They should be tied up carefully, and given an abundance of water.

Bulbs are often neglected in a garden, but there are some which are very hardy, and being decorative, deserve a place in any garden. They can be used as border plants, such as freesias, or crocus, or as bedding plants, such as daffodils, iris, and lilies. A good many of them do better in the higher and cooler altitudes, but the following plants are easily grown in most parts of Victoria so long as water is available when required.

Iris.—The bearded iris is the most popular of this family, and there are some beautiful varieties among the later ones. They prefer an open position, and a medium to heavy soil. It is very important to plant them just below the surface, and if the root stock is showing above ground level, they will grow better than if it is covered too deeply. They should be watered freely from the time the flower buds appear until the flowers die down, but during the summer allow to dry off. In the late winter, fork over the bed, and remove any superfluous leaves. Work in a light dressing of market garden manure, at the rate of 2 oz. per square yard. When necessary, divide them about January-April.

Freesias are easy to grow in any well-worked soil. They should be planted in March-May, and they will flower in the early spring. Plant in rows 6 inches apart, 3 inches between the bulbs, and about 1½ inches deep. Freesias have a beautiful perfume, and with the hybrids many different colours are obtainable.

Hyacinths prefer a light soil; containing a liberal amount of organic matter, such as well-rotted cow manure. Plant the bulbs in March-April, 3 to 4 inches deep, and 6 to 8 inches apart. They flower in September-October, and their sweet perfume and beautiful colouring make them very popular. They are also useful for growing in window boxes or in fibre in bowls. When the foliage dies down, lift the bulbs, and store in a dry shed until required for planting again.

The lachenalia is another attractive early spring flowering bulb, and it is easy to grow in any good garden soil. Plant 2 inches to 3 inches deep, and 4 inches to 5 inches between the corms. They are very suitable for pot culture, and the bell-shaped flowers droop from the flower spikes somewhat like a hyacinth. The varieties usually grown are—

Aurea—yellow.
Quadricolour—yellow, red, and green, with a purple edging.
Bicolour—yellow, with purple edging.

Although these bulbs are easily grown, the amateur sometimes finds that when they die down for their dormant period they are forgotten, and when the area is dug over, they may be discarded with the weeds. If possible, lift each year, and replant in another portion of the garden.

Vegetables.

Summer vegetables should have responded well to the February rainfall, and the tomatoes and French beans should be kept well picked. The rhubarb bed should be kept well hoed, and if any rhubarb starts to run to seed, pull off the flower stalks. Give the area a good dressing with farmyard manure, and, if necessary, the clumps may be taken up, divided, and replanted as required. Give the growing vegetables frequent hoeing with a Dutch hoe, to prevent the surface soil from setting too hard, and to keep down the weeds. Plant out cabbages, cauliflowers, lettuces, carrots, and parsnips.

Plant broad beans this month, and also an early variety of pea, such as William Hurst. In Victoria broad beans are not frost tender, so that they may be grown for use when it is not possible to have French beans. Unlike French beans, the pods are not used for culinary purposes, but the beans are removed and used similarly to peas.

The soil should be well prepared, and a liberal supply of farmyard manure worked into it. Beans, like other legumes, respond to superphosphate, and when planting add superphosphate at the rate of 2 oz. per square yard of row. The seed is usually sown either in single or double drills. The single drills should be 2 feet apart, and the double drills should be about 3 feet apart, with 6 to 9 inches between the double row. Plant the beans from 1½ to 2 inches deep and 6 inches apart. To ensure a succession of broad beans, it is advisable to make sowings in March, April, and May. The varieties sown are usually: Broad Windsor, Leviathan, Long Pod, and Cole's Dwarf Prolific. The plants are prone to attacks by aphis, so that a sharp lookout should be kept for this pest. If it appears, spray with nicotine sulphate, and repeat every fourteen days until the aphis disappears.

Leaf Variegation of the Apple

By
C. E. COLE, B.Agr.Sc.,
Horticultural Research Officer

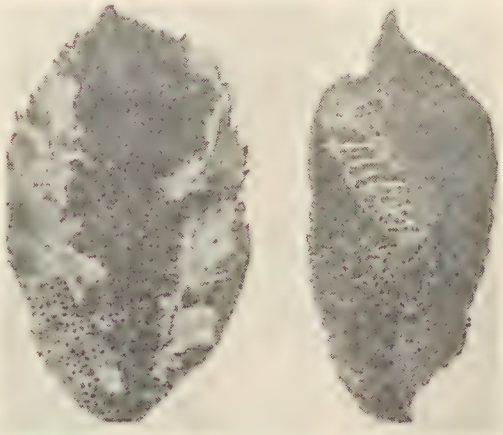


Fig. 1.—The variegation makes no regular pattern on the leaves, which are often distorted.

LEAF variegation of the apple is very common in Victorian orchards. It is so prevalent that it rivals black spot and codling moth in its ubiquity, but in contrast to them, its commercial effects are quite negligible. It is, however, a matter of interest and curiosity to many fruit growers, and to some a cause of anxiety. The information set out herein may satisfy the former and relieve the latter.

The variegation, which is illustrated in Fig. 1, takes the form of yellow, cream, or white splashes and blotches scattered irregularly over the leaf. Sometimes these blotches follow the main veins, but generally they occur anywhere on the leaf, the rest of which remains a normal green. The area occupied by the variegation varies from a single spot to almost the full leaf. Leaves affected by it often develop brown patches of dead tissue, and seem to be especially susceptible to injury by hot winds and sprays. Severely affected leaves may be distorted.

Fig. 2.—In rare cases the variegation may affect the young fruits.

The amount of variegation occurring on different trees ranges from a few affected leaves on a single shoot or spur to the other extreme. The amount appearing on any one tree from year to year also fluctuates considerably, varying roughly with the favorableness of the season to the growth of the tree. Lightly affected trees may fail to show any variegation at all in certain years. Varieties of apples differ in the extent to which they show it. Jonathan seems to be the most generally affected variety, and to show the largest amount of variegation. Other varieties, such as the London Pippin (Five Crown), show it only as a faint yellow-green mottling of the leaf, in consequence of which it is seldom noticed in them. A similar but much less common variegation has also been observed in pear trees, in apricot trees, and in plum trees.

The amount occurring in different orchards ranges from a few scattered trees up to almost every apple tree, but it does not appear to spread from tree to tree in the orchard. In spite of its widespread occurrence, however, there is no reason to suspect that it seriously impairs the efficiency of affected trees. One patch of Jonathans in the Mornington Peninsula has 98 per cent. of the trees quite severely affected, yet produces rather more fruit than the average for the district. In some instances badly variegated trees are small and stunted, but it is usually found that this condition can be attributed to some adverse

factor other than the variegation, such as poor drainage. An effect which could be of direct economic importance, but which fortunately is extremely rare, is a variegation of the skin of the fruit, which has been noted where leaf variegation is particularly severe. This fruit spotting is illustrated in Fig. 2.

The cause of this variegation has been under investigation in Victoria since 1934. Up to that time, several attempts had been made to isolate a disease-producing organism from affected leaves, but without success. The first theory tested was that of a mineral deficiency being responsible for the variegation. To this end many injections were made with "major" and "minor" elements, and some of these elements were applied to the soils. None of these trials resulted in any reduction of the amount of variegation in the treated trees. It may be mentioned in passing that a chlorosis caused by a "minor element" deficiency generally follows a regular pattern in the leaf. For example, iron chlorosis, illustrated in Fig. 3, causes the areas between the veins to turn yellow while the veins remain green. This distinction should be noted because deficiency chlorosis can and should be corrected, whereas variegation apparently cannot and need not be eliminated.

The next possibility was that the variegation might be due to a virus disease. By means of grafting experiments it was shown that scions from unaffected trees grafted on to affected trees soon developed variegation. Similarly, when a mixture of affected and unaffected scions was grafted on to an unaffected tree, both shoots from the tree itself and some of the previously unaffected scions developed variegation, although this transference of symptoms was slow and limited. This was in agreement with the work of two Michigan investitors, Bradford and Joley (1), who found that a similar variegation was produced in nursery stock when material from affected trees was used as an intermediate stock.

Fig. 3.—Variegation should not be confused with chloroses due to mineral deficiencies, such as iron chlorosis illustrated in the peach leaf on the left. Such chloroses follow a more or less regular pattern.

The conclusion drawn from this behaviour of the variegation is that it is the symptom of a virus disease. Observation has shown that it does not spread appreciably, if at all, in the orchard, but that it is transferred by budding and grafting operations, either in the nursery or in the orchard, and that most of the affected trees in Victoria originated in a small group of nurseries, other nurseries appearing to supply unaffected trees. The fact that it is not readily transferred by pruning or insects suggests that the virus cannot survive more than a few seconds except within the plant tissues.

It would appear that leaf variegation of the apple is a virus disease of little economic importance, transmitted by budding and grafting operations. If it is desired to avoid variegated trees, the only course seems to be to use stocks and scions which have shown no sign of the presence of this infection.

(1) Bradford and Joley.—"Infectious Variegation in the Apple." *Journal of Agric. Res.*, 46: 10.

Infectious Laryngotracheitis

A Disease of Poultry

By Harold E. Albiston, D.V.Sc., Veterinary Research Institute, University of Melbourne

IN 1924, a hitherto undescribed disease of poultry made its appearance in California and other parts of the United States of America. Known by a variety of names such as Influenza, Canadian 'Flu, Infectious Bronchitis, and Laryngotracheitis, this disease, characterized by symptoms of a respiratory nature, was for many years confined principally to the North American continent, and little interest in the condition was displayed by workers in other parts of the world. Within the last few years, however, its presence has been detected in England and Germany, and it was with surprise and no little consternation that a clinically similar condition, subsequently proved to be identical with the American form, was discovered some years ago in New South Wales and a week or two later in Victoria.

When first seen in North America, infectious laryngotracheitis appeared as an acute infection of the respiratory tract of birds, frequently accompanied by a fairly high mortality rate. Since then, further investigations have shown that the disease varies very considerably from time to time and in different flocks, and all gradations from an acute and relatively fatal infection to a mild transient disease with an insignificant mortality rate may be seen.

The cause of this disease is a filter-passing virus, which is quite specific in its action, and can be identified by suitably devised laboratory tests. As far as is known, the disease is confined to fowls and is not transmissible to other domestic poultry, or wild birds. References are made in certain works to the occurrence of similar diseases in turkeys, ducks, and pigeons, but their identity with infectious laryngotracheitis has not yet been proved.

In its acute form, the most pronounced symptom in an infected fowl is the manifestation of extreme respiratory distress. The bird elevates its head, extends the neck, and opens the mouth in an attempt to breathe. Not infrequently fits of coughing and sneezing may be exhibited, with the expectoration of bloodstained mucus from the windpipe. Sometimes the eyes and facial sinuses are involved, and a watery discharge from the eyes and nostrils appears. If death does not occur, the material in the windpipe, which at first consists of mucus containing varying amounts of blood, rapidly changes to a caseous or cheesy exudate. Not infrequently the windpipe may become completely occluded, and the resulting obstruction to the passage of air causes the sudden death of the bird through suffocation.

Post-mortem examination of a typical, acute case of this disease shows that the lesions are confined to the upper respiratory tract. The mucous lining of the windpipe shows inflammatory changes, the larynx may be swollen, and varying amounts of exudate, either mucinous or caseous and blood-stained, are found in the windpipe even as far down as the bronchial tubes. Although the causal virus may be isolated from the spleen and liver of affected birds, these organs show no obvious changes.

The symptoms and lesions of laryngotracheitis vary greatly in different birds and in different flocks. All grades of infection may be seen from the acute form described above to the form where, apart from some slight injection of the laryngeal mucosa and a slight excess of mucus, no abnormality is found at post-mortem, and the affected bird reveals no evidence of ill-health during life. Sometimes the only indication of the presence of the disease is given by an occasional sudden death in an apparently healthy flock of birds. Post-mortem examination reveals a plug of yellowish-white cheesy material wedged in the entrance to the larynx, causing asphyxia. Occasionally birds in such a flock may show some mouth breathing, and if carefully inspected, especially at night, they may exhibit an abnormal incidence of coughing and sneezing.

There appears to be no doubt that the condition popularly called "roup" by the poultry farmer is in some instances due to the virus of laryngotracheitis. For many years there has been considerable confusion regarding the identity of the respiratory diseases of fowls. For instance,

Bird affected with infectious laryngotracheitis. It is gasping for breath and emitting shrill cries. [Ag. Gaz., N.S.W.

the virus of fowl pox is capable of producing changes in the respiratory tract similar to those caused by infectious laryngotracheitis, and judged on the symptoms and post-mortem signs shown by affected birds, these two diseases are sometimes indistinguishable. Dr. F. M. Burnet, of the Melbourne Hospital, has devised a method whereby some of the virus diseases of birds may be accurately identified, and it was mainly due to his assistance that the presence of infectious laryngotracheitis in Australia was confirmed.

Until the early part of 1935, the presence of this virus in Australia had not been recognized. An investigation by Dr. Seddon, Director of the Veterinary Research Station at Glenfield, N.S.W., of several outbreaks of a serious disease of poultry which occurred in New South Wales in the autumn of 1935 revealed the presence of an acute respiratory condition, indistinguishable clinically from the acute form of infectious laryngotracheitis, and experimental research subsequently confirmed its identity. Prompt measures were taken by the authorities in that State to limit this acute disease to the infected properties. Shortly after the disease had been identified in New South Wales, the virus was discovered in two fowls which died suddenly on a poultry farm in Victoria. A careful examination of the remaining birds on this farm, however, failed to reveal any evidence of an acute infectious disease, and from the history of the flock supplied by the owner, it appeared probable that the disease had been present on this property for a number of years, in a very mild form, the majority of infected fowls showing no symptoms of the disease, or recovering spontaneously after a transient indisposition. A survey of a number of poultry farms was then made, and a blood examination of fowls on these properties showed quite conclusively that this complaint has been present in Victoria for some time, but as far as is known, the acute type of the disease with a relatively high mortality rate has not yet been seen in this State.

The reasons why an infectious disease of this nature suddenly assumes an acute and serious form are at the present time unknown. It is probable that the mild form has been endemic in the flocks of New South Wales for some years and under the influence of factors which are at present not understood the virus has become stronger or more virulent, resulting in the serious outbreaks referred to above. The possibility of a similar increase in virulence of the disease occurring in Victoria must be kept in mind, and poultry farmers are urged to notify authorities immediately there are any outbreaks of an acute respiratory disease among their flocks.

Owing to the widespread nature of the disease, it is doubtful whether any measures for its control and eradication would be effective, or even justified, as long as it retains its mild form. Should the virulence increase, and the infection prove serious in its effects, then it may be necessary to adopt stringent control methods for the protection of the poultry industry in this State.

The School of Dairy Technology, Werribee.

Neutralization of Sour Cream for Buttermaking

1.—Estimation of Acidity of Cream

By F. S. J. Newman, B.Agr.Sc., Dairy Technologist, and W. J. Wiley, D.Sc., Dairy Research Officer of the Council for Scientific and Industrial Research

This is the first of a series of articles on the neutralization of cream for buttermaking and covering the results of research work carried out at the School of Dairy Technology, Werribee

THE "neutralization" of sour cream before manufacture into butter is now a well-established practice in countries which aim at producing a butter of good keeping quality in cold storage. A voluminous literature quoting many experimental results has amply demonstrated that the practice is essential for the manufacture of such butter. This literature need not be reviewed here, and in any case years of experience in Australia have shown the wisdom of the practice. However, there is still discussion on various aspects of the technique and the most desirable degree of "neutralization." (The term "neutralization" in the butter industry is applied to the reduction of the acidity of the cream to a more or less predetermined figure.)

The acidity of the cream is obviously standardized with the object of controlling the acidity of the finished butter. The acidity of the butter when required for purposes of predicting keeping quality is generally measured by determining the pH of the serum. The relationship between the pH of the butter and the pH and titratable acidity of the cream from which it was made will be discussed later in this series of papers, but it may be mentioned here that the pH of the butter approximates that of the cream, and that the pH of the cream can be controlled by controlling the titratable acidity. It is this latter factor, the titratable acidity (expressed as "per cent. lactic acid") which the factory operative always uses for the purposes of neutralization.

Published results of examinations of Australian butters Loftus Hills, Scharp, and Bellair (1), Trembath and Newman (2), Pont and Sutton (3), Kretchmar (4)), show considerable variations in the pH. While some of these variations are due to differences of

opinion as to the most desirable degree of neutralization others are undoubtedly due to faulty methods in the factory. The object of the work described in the following series of papers was to determine the influence of several factors on the accuracy of neutralization, and to determine a procedure which should enable reasonably accurate control of the acidity of the finished butter.

As the neutralization is controlled in the factory by titration of the cream it is important that this titration should be made by a method capable of giving reproducible results. The most usual method is to titrate 9 ml. of cream mixed with 9 ml. of water, which is used to rinse the pipette. Decinormal sodium hydroxide is used, and phenol-phthalein is the indicator.

McDowall and McDowell (5) have pointed out the large errors that can occur in this titration, and the divergence of results obtained by factory operatives and laboratory workers. They have proposed a method which should lead to a more standardized titration. Most of their work, however, was confined to creams of lower acidity than those common in Australia, and may not be applicable to the high acid creams often received here. The experimental work described here was done with typical fresh and sour creams containing 35-40 per cent. of fat. The influence on the titration of (*a*) the quantity of indicator used, (*b*) the method of measuring the sample, (*c*) carbon dioxide, and (*d*) dilution of the sample were investigated.

(*a*) The Effect of Quantity of Indicator Used.

McDowall and McDowell (5) have pointed out that the proportion of indicator has a considerable influence on the result of the titration. With increasing quantities of indicator up to a certain limit, lower results are obtained, and it is desirable to have sufficient indicator present to exceed this limit. They suggest 0·5 ml. of a 1 per cent. phenol-phthalein solution to 9 ml. of cream mixed with 9 ml. of water. Our results fully confirm their findings, and need not be quoted in full. A typical result for a sour cream is as follows:—

	Drops of 1 per cent. phenol-phthalein solution added to 18 grams cream + 18 m.l. water.				
Acidity as per cent. lactic acid	1	5	10	15	20
	·48	·46	·44	·45	·44

The titrations quoted in the following work were made with five drops of a 5 per cent. solution of phenol-phthalein added to 18 grams or 18 ml. of cream; a sufficient quantity to pass the region where there is a sharp increase in acidity with quantity of indicator used.

(*b*) The Measurement of the Sample.

It is a common practice to take 9 ml. of cream and base all the subsequent calculations on the assumption that this weighs 9 grams. The following table gives some results which show the differences that occurred when 18 grams or 18 ml. of cream were taken for the titration (18 grams were taken in order to increase the accuracy of the titration somewhat over that using 9 grams). The creams were diluted with an equal volume of water before titrating.

Acidity as Per Cent. Lactic Acid.

18 ml. Cream.	*18 grams Cream.*	*Difference.*
·10	·10	0
·16	·17	+·01
·22	·25	
·33	·35	+·02
·35	·37	+·02
·37	·41	+·04
·38	·40	+·02
·43	·47	+·04
·44	·46	+·02
·56	·69	+·13

As cream has a somewhat lower density than water one would expect a lower acidity when the cream is measured volumetrically. The difference due to this cause, however, is negligible, and within the working error of the titration. With creams of low acidity the results of both methods are practically identical, but when appreciable acidity has developed the table shows that large and erratic variations can occur. The variation between the methods in this case is due to bubbles of gas caused by agitation and bacterial action being entrapped in the viscous cream, so reducing the quantity of cream taken when it is measured in a pipette. In the case of one very acid cream it was found that 9 ml. weighed only 7·3 grams.

(*c*) The Effect of Carbon Dioxide.

McDowall and McDowell (6) investigated the influence of the carbon dioxide naturally present in milk and cream on the titratable acidity. They did not discuss the possible influence of this on the process of neutralization although in a subsequent paper (7) they investigated in detail the influence of carbon

dioxide liberated from the sodium bicarbonate used as a neutralizer. It appears desirable to investigate whether there is sufficient carbon dioxide naturally present in creams of high acidity to have an appreciable effect on the accuracy of neutralization. An error may be caused by the presence of carbon dioxide because it titrates as a monobasic acid when determining the acidity of the cream, but is largely driven off during the process of pasteurization subsequent to neutralization, thereby leading to a greater reduction in acidity than anticipated.

The influence of the carbon dioxide on the titration was determined by titrating both boiled and unboiled samples of the cream. Admittedly there may be minor alterations in the titration due to the influence of heat on certain of the salts of the cream, but if these alterations occur they would also take place in the process of pasteurization.

Eighteen grams of cream were diluted with 18 ml. of distilled water in a porcelain basin. The sample to be titrated after boiling was gently boiled for 2 minutes, with continuous stirring.

The following table gives some typical results obtained during a season of butter making:—

Acidity as Per Cent. Lactic Acid.

Boiled Sample.	*Unboiled Sample.*	*Difference.*
·10	·10	0
·13	·15	+·02
·15	·17	+·02
·22	·26	+·04
·29	·30	+·01
·31	·37	+·06
·35	·40	+·05
·38	·40	+·02
·40	·41	+·01
·43	·51	+·08
·45	·50	+·05
·49	·55	+·06

The results are in accord with those of McDowall and McDowell (6) in that there is a tendency for a higher proportion of carbon dioxide to be present in the more acid creams than in those of low acidity. There is, however, no constant relationship between carbon dioxide content and acidity. Probably the bacterial flora and physical condition and handling of the cream are important factors in governing the production and retention of the carbon dioxide.

It is common practice to attempt to neutralize the cream to an acidity of the order of 0·08 per cent. acidity. The above table shows that if cognizance is not taken of the carbon dioxide in the cream considerable departures from the desired figure will occur with many acid creams. The results demonstrate the fallacy of the practice adopted in some commercial factories of making an arbitrary allowance in calculating the required quantity of neutralizer to add to the cream to compensate for the loss of carbon dioxide during pasteurization.

(*d*) Effect of Dilution of the Sample before Titrating.

Sommer and Menos (8) have studied the effect of dilution on the titration of milk. Dilution lowers the apparent acidity because of a decreased precipitation of tricalcium phosphate as the end point is approached. A dilution of 1: 1 reduces the acidity of milk by 0·02 per cent., and a dilution of 1: 1·7 by about 0·025 per cent. When cream containing 40 per cent. of fat is diluted 1: 1, the serum which contains the "acid" is diluted with about 1·7 times its volume of water, and so its acidity would be reduced by about 0·025 per cent. When titrating the cream the acidity is calculated on the weight of cream taken, and as this contains 60 per cent. of serum, one might anticipate that a dilution of 1: 1 would reduce the acidity by 60 per cent. of 0·025, i.e., 0·015 per cent.

The effect of dilution has been measured in this laboratory on several types of cream at periods throughout the butter-making season. A dilution of 1: 1 has caused a reduction of from 0·01 to 0·02. Some typical figures are given in the following table. Except in the case of the neutralized pasteurized creams the samples were boiled before titrating.

Per Cent. of Acidity Found After Dilution.

Cream.	Ml. H_2O Added to 18 Grams Cream.					
	0.	10.	20.	30.	40.	50.
Fresh	0·08	0·07	0·07	0·06	0·06	0·06
"	0·10	0·08	0·08	..	0·07	0·6
Neutralized Pasteurized	0·03	0·03	0·02	..	0·02	..
	0·10	0·08	0·06	..	0·06	..
Sour	0·33	..	0·32	..	0·31	0·31
"	0·35	0·33	0·33	..	0·35	..
"	0·40	0·39	0·39	..	0·39	0·39
"	0·45	0·44	0·44	..	0·45	0·44

The low reduction in acidity sometimes observed in some creams is probably due to the coagulated casein not reacting completely with the alkali in the short time taken for the titration.

It will be seen that with the usual practice of diluting 1 : 1 there can be an error up to 0·02 per cent. acidity in the titration, and consequently in the neutralization. However, it is difficult to obtain a satisfactory titration of coagulated cream without dilution, and as the error is small and not constant, any attempt to correct for it in practice appears to be hardly justifiable.

The results show that the volume of water added for the titration need not be critically measured so long as it is kept of the same order as the volume of cream.

Discussion and Conclusions.

The results show that the accuracy of the titration can be affected by such factors as the quantity of indicator used, the method of measuring the sample, carbon dioxide in the cream, and dilution of the cream. Another important factor is the end point to be taken. This is not sharp when titrating cream. McDowall and McDowell (5) advise using a colour standard prepared from rosaniline hydrochloride as a guide to the correct intensity of colour to adopt as the end point, and one would expect that this would make for more concordant titrations. It has been our experience, however, with factory operatives attending the School of Dairy Technology, Werribee, that more concordant results were obtained if they were instructed to titrate to the first perceptible tinge of pink appearing in the yellow cream colour. They appeared to find it easier to detect the first change than to match the faint colour of the comparison standard.

The experimental results show that if accuracy is to be obtained with the acid creams common in many Australian factories the effect of carbon dioxide and method of measuring the sample must be considered. The sample should be boiled to eliminate the effect of carbon dioxide. When the weight of cream in the neutralizing vat is known the sample to be titrated should be weighed. If the quantity of cream in the vat is measured with a dip stick it is preferable to measure the sample with a pipette, although this practice cannot be expected to be as accurate as the former one.

Some increase in accuracy is obtained by taking 18 grams or 18 ml. of cream instead of the more usual 9 gram or 9 ml.

Taking the above considerations into view the recommended method of titration is as follows:—

> Eighteen grams (or 18 ml. if the cream in the vat is measured volumetrically) are taken in a white container, such as a porcelain basin, 18 ml. of water are added and the mixture heated to boiling, and boiled gently for 2 minutes, with constant stirring to avoid loss of sample by spitting. Five or six drops of 5 per cent. phenolphthalein solution are then added and the titration proceeded with, using the glass rod for mixing, until the first perceptible tinge of pink colour appears.

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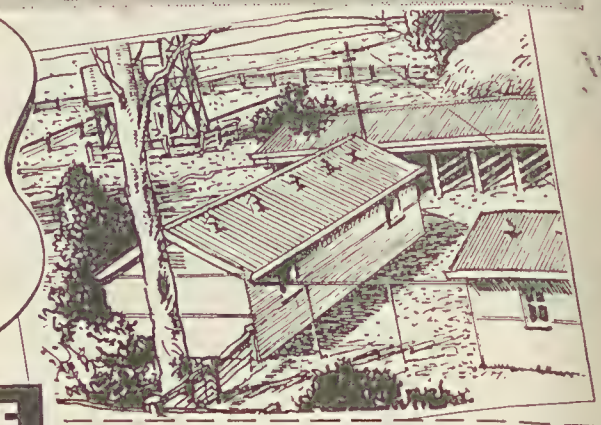

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Journal of Agriculture, Victoria—April, 1941.

Pasture Improvement

Hints on Seeding and Choice of Species

By L. C. BARTELS, B.Agr.Sc., Senior Agrostologist

THERE are two main ways open to Victorian farmers to improve their pastures:—

1. The introduction of better species and strains of grasses and clovers, and
2. The raising of soil fertility.

These are inter-connected and the second is perhaps of greater importance because, until the land is improved and made receptive to the better species, money and effort expended in sowing may be wasted. Top-dressed pastures and the grazing animals themselves can be soil-improving agents, so that fertility building is progressive and full results may not be achieved for some time.

The building up and maintenance of pastures in a productive condition is of the greatest economic importance. Good pastures provide the cheapest food supply for farm stock. They not only give an immediate cash return, but will enhance the value of the property as a whole. The selection of appropriate species for seeding is of basic importance and is discussed in this article which also deals with the establishment of pastures in the better rainfall areas of Victoria.

The gradual extension of the areas in seeded pastures in Victoria is a most encouraging feature of the developments in pasture improvement which have taken place in this State over the last decade, and, although progress has been interrupted by unfavorable conditions during the last three years, this autumn may present better conditions for renewal of activity.

There should be no need to impress upon farmers the value of improved pastures. They provide the cheapest form of maintenance for farm animals, and under present conditions much land regularly cultivated may be sown to pastures. It will remain productive and fertility will be regenerated.

Circumstances govern the choice of species, and these are variable from place to place. Yearly rainfall, incidence of the rain, type of soil, and the purpose for which the pasture is intended all have a bearing on the matter, but under all conditions it is desirable that a leguminous plant be sown. Legumes (represented by clovers and medicks) by virtue of an association with nitrifying bacteria are nitrogen gatherers. Associated plants benefit and legumes are prime factors in the accretion of soil fertility.

Despite the undoubted value of our native grasses and the fact that they are the source of great wealth of pastoral production, they have limitations, and we are dependent to a large extent on introduced species. Most of the grasses and clovers recommended for sowing are of European origin. It may be remarked in passing that we have no native clovers, and despite the fact that many "trefoils" are so widespread as to be quasi-indigenous, all of them have been introduced, some to find conditions here more favorable than in their native habitat.

Lucerne trials in the Burnley Plant Research field. Lucerne is a good summer fodder crop in dry districts.

Because many of the most valued pasture species came originally from Europe they developed under conditions unlike those presented here except in the better rainfall areas of the State. They were subjected in the main to climatic conditions very different from our own—a hardy grass in Europe might mean one which would withstand cold rigorous winter. To us the term would imply one able to withstand heat or prolonged drought.

Like most living things, pasture plants are able to adapt themselves to a range of conditions, but nature makes many pasture species flexible in that, instead of being uniform they are a multiplicity of types with some predominant in any particular environment, but in changed circumstances other types are favoured to the exclusion of the unfit, which are suppressed or eliminated except that they keep recurring by segregation. That explains what is meant by "regional strains"; it explains, too, why, within a species, we have plants conforming to type, but differing very much in inherent characters; why by natural selection over a number of years we have strains more suited to our conditions or a greater range of conditions than the types from which they evolved.

The Department of Agriculture, by critical investigation, has demonstrated the superior agronomic worth to us of these local strains and by the institution of seed certification schemes has endeavoured to preserve in trade channels the identity of the produce of our best fields of grass and clover. Certification under Victorian certification schemes involves inspection of the growing crop to determine its fitness for the production of certified seed, "growing on" tests if necessary, the supervision of harvesting and recleaning, and the subsequent certification of the seed and sealing of bags.

The development of certification schemes which put a premium on better strains of pasture plants has done much to promote pasture improvement, and it is emphasized that no farmer can disregard this in purchasing seeds.

Many farmers appraise seed by appearance and smell, they pay little attention to the history of origin of the seed, and although they know that seeds vary in germinating capacity and in grades of purity they rarely avail themselves of the facilities offered by the Department of Agriculture to test doubtful seeds.

A vendor of seeds is required to maintain standards prescribed by regulations under the Seeds Act. He must label seeds correctly and is bound to give an invoice with correct statements which are equivalent to a guarantee, and all the non-warranty conditions of sale he may seek to make will not avail him if he commits a breach of the regulations by selling defective seeds.

On the other hand, only the farmer's awareness will protect him. He should be prepared to pay for superior seed, and he deserves what he gets if he makes cheapness his only consideration.

Grass species which are of great value under conditions in Victoria are perennial rye grass, Italian rye grass, Wimmera rye grass, cocksfoot, *Phalaris tuberosa,* and *Paspalum dilatatum.* Clovers of value are white clover, red clover, subterranean clover, strawberry clover, and alsike clover. The invaluable fodder, lucerne, is in a class apart, and there are a host of other plants which occur naturally or are useful under special conditions—the numerous "trefoils" are examples.

A brief description of each of the above may be helpful.

Perennial Rye Grass is the basis of most improved pastures in districts where rainfall is above 22 inches. It is adapted to soils of heavy or medium texture, and makes most growth in autumn, winter, and spring.

It persists without growth through dry summers, but it gives a "green pick" in response to summer and early autumn rains.

Confusion arises in the minds of farmers by the numerous names applied. Perennial rye grass embraces English rye grass, Irish rye

A general view of the perennial rye-grass strain trials at Burnley.

grass, Irish Ben, New Zealand rye grass, Hawkes Bay rye grass, Poverty Bay rye grass, Western District rye grass, &c., but in the light of what has been said above, farmers may understand the need for discriminating between them. Briefly, they should choose, firstly, seed which is the produce of old fields in Victoria, and secondly, seed which is produced under nearly similar conditions in Tasmania or New Zealand. Again, it must be emphasized that a country like New Zealand, with its range of conditions, produces many strains of perennial rye grass, some of great value, but others which are only pseudo perennial and almost worthless as a base for permanent pasture.

The Victorian strains are distinct from the New Zealand strain in making better growth during winter and in making rapid growth earlier in the spring. The leaves are slightly longer and broader.

Italian Rye Grass is listed next, but it differs very much from perennial rye grass. It is an annual or biennial rye grass, and requires fertility and moisture for best growth. It makes good winter growth, and under favorable conditions it provides palatable feed in winter. The foliage of Italian rye grass is broader than that of perennial rye grass, and the grass grows taller, so that it is often sown for meadow hay. The seed covering has an awn or "whisker" which distinguishes it from perennial rye grass seed.

Wimmera Rye Grass is an annual grass of wonderful value in its proper sphere, which is the lower rainfall areas of the State. It

Single plants of rye-grass showing comparative growth at the end of the first winter. 1. Victorian; 2. New Zealand uncertified (note stemmy growth); 3. New Zealand certified; 4. Irish, imported.

Italian rye grass persists only under very favourable conditions, and may be regarded as a temporary element in pastures.

spreads naturally in some districts where the average rainfall is as low as 14 inches. It makes rapid growth in autumn if moisture conditions are favorable for germination and early development, and provides good feed in winter, displacing "barley grass" and "hair grass." It seeds freely, and the spring growth may leave a residue of rather harsh but useful feed. It is interesting to note that this grass is thought to be the outcome of a cross between rigid rye grass and Italian rye grass. It is very variable, and some of the types it includes resemble both those species.

Cocksfoot is a perennial, summer growing species. It ranks next in importance to perennial rye grass, and it is indeed the dominant grass in Gippsland pastures, particularly in the higher rainfall areas and on the loose soils of the volcanic areas. It is not conspicuous in the better Western District pastures, although its successful introduction there would mean an acquisition. The limiting factor is not soil so much as the dryness of the summer, because cocksfoot is successfully maintained on a wide variety of soils when irrigated.

Cocksfoot, a prominent species in Gippsland hill pastures.

The value of cocksfoot is determined largely by the management applied to it, and it has been underrated by many, who would refer to it as a "second rate grass," a "hill country grass," and the rough tussocky condition of many cocksfoot pastures would suggest that it is not readily eaten, but in spite of this it is a very valuable grass, and the young growth is eaten even in preference to rye grass. It should be kept down by hard grazing and/or occasional clipping. If allowed to grow tall, the foliage becomes harsh and unpalatable. Superior strains of

fine leaved cocksfoot have developed in Gippsland and New Zealand.

Phalaris tuberosa, or Toowoomba canary grass, is growing in favour. It is a perennial winter growing grass which assumes a tussocky habit. The stems develop bulbous bases. It grows well in damp conditions and on heavy soils, but its deep roots give it wonderful resistance to dryness and it is grown successfully in districts where perennial rye grass will not endure.

Although it is very assertive when established, the seedlings are sensitive to competition and it is recommended that it be sown on a clean seed bed.

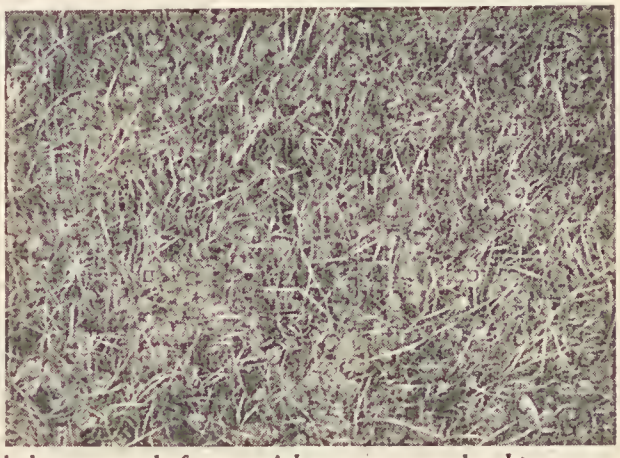
The seed is expensive, but 3 or 4 lb. per acre will suffice to lay the foundation of a dense sward. It is a very useful grass, but the foliage of a mature plant is coarse and not very palatable. Its ability to make rapid growth after autumn rains is a valuable feature, but the spring growth with the tall seed stalks which develop make feed of only moderate value and it should be kept down. Ordinarily this grass does not spread naturally.

Paspalum dilatatum, variously regarded as a nuisance and a valuable pasture element, is a perennial summer growing grass which becomes tussocky as the sward gets older, and if the pasture is allowed to deteriorate the soil may become sod bound and unproductive.

Paspalum combines adaptation to wet conditions with great resistance to dryness. With warmth and moisture it makes abundant growth, which must be controlled or it is apt to run to tall growing seed stalks, which will dominate and suppress more valuable elements. It is checked by frost, and makes little or no growth in winter. If kept down, the short growth is palatable and nutritious, and an association of other species, particularly clovers, invests a paspalum mixture with high carrying capacity.

Clovers.

White Clover is the queen of the clovers. It is a perennial, and grows best in the warmer seasons of the year if adequate moisture is available. It grows best where summer rains occur, and it demands good soil fertility. It is at its best on some of the rich flats of Gippsland, but it luxuriates under irrigation. It is very responsive to topdressing with phosphatic manures.



A dense sward of perennial rye-grass and subterranean clover.

Natural selection has provided New Zealand and Victorian farmers with superior strains, and the importance of sowing only these better varieties is emphasized. White clover has a stoloniferous or creeping habit of growth, and the stems root at the joints so that it is flexible. It is one species which is favoured if the overgrowth of tall grasses is controlled.

Subterranean Clover, while not as good as white clover, is undoubtedly the most valuable clover we have available, and has proved itself a wonderful agent in the work of pasture improvement in this State. It does not require the same conditions as white clover—it will grow on poorer soils, somewhat acid, but its main virtue is its ability to persist in lower rainfall zones. It likes adequate moisture, and thrives where at least 22 inches are received, but it is successfully maintained even where the annual rainfall is as low as 17 inches. Subterranean clover is an annual and a winter grower—it starts with favorable rains in autumn, and if they occur early enough it makes very rapid growth and provides a lot of valuable feed in winter. It grows well in spring, and although it dies down in late spring the dry herbage and the burrs containing seed will provide good feed for stock in the summer. Subterranean clover is indifferent to summer conditions, and it secures its continuance by burying its seed. The flowers occur in clusters of three or four, and when the flowers are fertilized they turn downwards. Little processes develop which fasten the seed in the soil. As with most clovers, a wonderful natural provision guards against extinction through

abortive germination. Many of the seeds produced will not germinate while temperatures are high, and there is generally a proportion of hard seeds which remain for months or even years before they germinate.

The recognition and propagation of different strains of subterranean clover has extended its sphere of usefulness. They have been classified according to time of flowering, and farmers now have early flowering, mid-seasonal, and late strains available.

The mid-seasonal types are represented by the widely spread Mt. Barker strain, which is the subterranean clover of commerce, and early types include "Dwalganup," "Bacchus Marsh," and "Mulwala," while the best known late maturing type is "Tallarook."

The early types are valuable because they can grow and reproduce under conditions too dry for mid-seasonal subterranean clover, but they are less leafy than the later types, and it is a mistake to sow them under conditions where mid-seasonal or late subterranean clover will thrive.

Subterranean clover is hardy, it can be established cheaply and easily, and commonly it is introduced effectively by a light seeding at the base of a cereal crop. It is a fertility builder, and as such is often the precursor of the better grasses. Subterranean clover can be established by "surface-sowing." In some districts it can be introduced by mixing it with manure when topdressing.

Strawberry Clover is a very valuable clover which is often denied due recognition because it does not present abundant feed, but it is so palatable to stock that it is generally hard grazed.

It is a perennial and a summer grower. Like white clover it has a creeping habit and plants radiate into patches. It luxuriates in wet places, but displays great resistance to dryness and it is tolerant of salty or alkaline conditions. It is valuable on reclaimed tidal swamps, and grows abundantly under irrigation on some of the "salty" lands in the irrigation districts where "giant" types have spread.

Strawberry clover is a feature of many Western District pastures, and occurs in some of the shallow swamps there. If it were fostered by liberal applications of superphosphate—even 3 or 4 cwt. per acre every year—these wet patches would be most valuable adjuncts to the main pastures. Like all the clovers under review, strawberry clover presents many variants. Seed is not produced in Victoria in any quantity, although the vigour and leafiness of the irrigation types occurring at Cohuna and Swan Hill would warrant it,

Strawberry clover plots in the Burnley Plant Research field. Left, Palestine—a spring flowering strain; Right, Victorian strain—summer flowering.

[Continued on page 174.

Sunday Milk Delivery

Board Chairman's Views

Discussing the question of Sunday milk delivery, the Chairman of the Milk Board (Mr. J. T. Packer) said recently that he agreed with the views of the Chairman of the Health Commission (Dr. Featonby), "that the elimination of the Sunday milk delivery would be a very retrograde step from a health point of view and would stultify all the efforts which the Milk Board and Agriculture Department have been and are making to improve the quality of Melbourne's milk supply."

The supply of wholesome milk to metropolitan consumers, Mr. Packer added, is as essential on a Sunday as on all other days of the week. Bakers can produce a double batch of bread on Friday so that consumers may receive on Saturday two days' supply for the weekend, but the production of milk is not similar to the production of bread or other factory-made commodities.

There is no known method of making cows produce a double supply of milk every sixth day and spell on the seventh. Cows produce milk every day and they must be milked regularly twice daily, every day, during their milk production period.

A safe metropolitan milk supply requires that milk must be transported from the farm to the metropolitan retail distributor as soon as practicable after production, treated by refrigeration and distributed regularly each day to consumers. This is the method adopted throughout the world for a fresh and pure city milk supply.

The Department of Agriculture and the Milk Board have concentrated their efforts on seeing that milk consumers are provided every day of the year with a safe, fresh and wholesome milk supply. A break once a week in regular daily delivery to consumers is an impracticable proposal. If it were adopted the dairy farmer in some miraculous manner, would have to supply a double quantity of milk to his retailer on Friday and separate or throw away the milk produced on Saturday. The alternative is for Saturday's milk to be distributed to consumers on Monday, Sunday's milk on Tuesday and so on throughout each day of the week. By this method consumers would receive stale milk every day of the week.

During summer months milk is transported twice a day from the farm to the metropolitan retailer to safeguard its hygienic condition. If this policy were dropped every seventh day, chaotic conditions would follow and it would be impossible to maintain a safe city milk supply during warm weather periods.

Milk Board contracts between dairy farmers and retail distributors demand of the farmer a regular daily supply of milk for the 365 days of the yearly contract agreement, with a warranty condition "that every consignment is pure, unadulterated *new* milk, sweet, clean and marketable."

Quality of Butter

Warning to Factory Managers

Following an investigation into complaints of the inferior quality of some Victorian butter, the Minister of Agriculture, Mr. E. J. Hogan said he was satisfied that a contributing cause was the imperfect degree of cleanliness of the factories responsible and the failure of the managers to give to factory hygiene the proper attention which the manufacturing of dairy produce requires. Many problems in regard to which Dairy Inspectors are called upon for advice are the result of negligence or incompetence on the part of the manager and staff.

Factory managers must not expect the Department of Agriculture merely to offer advice on such matters. Cleanliness is the main feature of efficiency in butter and cheese manufacture and any one holding the position of a factory manager should appreciate that fact.

Inspecting officers will continue to advise factory managers on problems involving advanced technical knowledge, but where the defect involves the standard of hygiene expressly required by the regulations, and where Departmental advice has not been acted upon prosecutions will ensue.

Questions and Answers

The following questions have been received from correspondents and it is considered that the replies will be of general interest.

QUESTION.—I have read with interest your free leaflet on *Hydatid Disease of Animals and Man,* which indicates how to free dogs of tapeworms. Kindly advise me whether, after having dosed dogs once or twice, it is necessary to continue dosing?

ANSWER.—Having dosed your dogs with arecoline several times, and found that there is no evidence of tapeworms, it may be assumed that they are free of these parasites. Further, if you can be sure that the dogs are not fed on raw offal which may contain cysts, and cannot gain access to dead carcasses or other source of re-infestation, there is no object in continuing dosing. Such freedom from re-infestation, however, is practically impossible on a farm.

NOTE.—The above-mentioned pamphlet may be obtained on application to the Chief Veterinary Inspector, Department of Agriculture, Melbourne C.2, and stock owners requiring further information on this matter should write to that address.

QUESTION.—I have more maize than is required for present use, and I would like to convert it into silage. Would you please inform me how I would do this?

ANSWER.—Maize may be ensiled very successfully, particularly if it can be chaffed to secure close packing, but it also ensiles well if stacked or pitted whole, providing the stalks are not crossed. That is practicable enough in a pit, but if the maize is stacked a row of tall posts has to be erected on each side of the stack to retain the fodder.

QUESTION.—Does the Department of Agriculture issue fruit-packing charts, and, if so, for what fruits?

ANSWER.—Charts for the packing of the under-mentioned fruits are available free of cost on application to the Director, Department of Agriculture, Melbourne, C.2:—

Apples.

Apples for export in the standard apple box (18 in. x 11½ in. x 10½ in.).

"Yates" apples, in the standard apple box (18 in. x 11½ in. x 10½ in.).

Apples in the long bushel case (26 in. x 6 in. x 14¼ in.).

Apples in the Australian dump case (18 in. x 8⅔ in. x 14¼ in.).

Pears.

"Josephine" pears, in the long bushel case (26 in. x 6 in. x 14¼ in.).

"Packham's Triumph" and "Beurre Bosc" pears, in the long bushel case (26 in. x 6 in. x 14¼ in.).

Pears in the 8½-in. standard pear case (18 in. x 11½ in. x 8½ in.).

Citrus.

Oranges in the citrus case (export) (24 in. x 11½ in. x 11½ in.).

Grapefruit in the citrus case (export) (24 in. x 11½ in. x 11½ in.).

Lemons, in the citrus export half case (24 in. x 11½ in. x 5¼ in.).

Oranges in the Australian dump case (18 in. x 8⅔ in. x 14¼ in.).

Lemons in the Australian dump case (18 in. x 8⅔ in. x 14¼ in.).

Grapefruit in the Australian dump case (18 in. x 8⅔ in. x 14¼ in.).

Emperor Mandarins in long bushel case (26 in. x 6 in. x 14¼.).

Other Fruits.

Tomatoes, in the long bushel case (26 in. x 6 in. x 14¼ in.).

Tomatoes, in the half standard case (18 in. x 5¼ in. x 11½ in.).

Tomatoes, in the half dump case (18 in. x 8⅔ in. x 7⅛ in.), wide system.

Tomatoes, in the half dump case 18 in. x 7⅛ in., x 8⅔ in.), narrow system.

Plums—Grand Duke and President (wrapped), in half long bushel case (26 in. x 6 in. x 7⅛ in.).

Grapes, for local market, in long bushel case (26 in. x 6 in. x 14¼ in.).

Grapes, for export market, in Australian export grape case (24 5/16 in. x 12½ in. x 6½ in.).

Passion Fruit, in long bushel case (26 in. x 6 in. x 14¼ in.).

Passion Fruit, in half long bushel case (26 in. x 6 in. x 7⅛ in.).

Passion Fruit, in half dump case (18 in. x 8⅔ in. x 7⅛ in.).

Passion Fruit, in half standard case (18 in. x 11½ in. 5¼ in.).

Peaches, in long bushel case (26 in. x 6 in. x 14¼ in.).

If you experience any difficulty in packing your fruit, the services of a fruit-packing instructor will be made available on request.

Irrigated Summer Fodder Crops

Competition at Boort, 1940-41

Report of the Judge,

A. MORGAN, B.Agr.Sc., Irrigation Field Officer

THE reports of judges of the Boort irrigated crops competition in previous years provide very interesting reading. In the main they emphasize the progress noted from year to year in such directions as the extension of the area sown to lucerne and to subterranean clover, the spread of the practice of good manurial treatment with superphosphate, and the speeding up of the all-important work of grading.

Following this series of complimentary reports, which have given due credit to those who have pioneered the development of sound practices in the district, one may be pardoned for drawing attention to the less praiseworthy aspects of local irrigated culture.

A disturbing observation was made during the inspection of areas of heavy box land carrying crops of summer fodders, principally ambercane and Japanese millet. It was that a block for which a high price (for unimproved land) had been paid is now showing a number of salt-affected sterile patches.

Without the advantage of an extended and extensive knowledge of the district, the writer is not in a position to say whether these patches are of recent origin, or whether they are increasing in size or number. However, it is permissible to conclude that in certain areas the ill-advised use of irrigation facilities has produced water-logging of the soil, and that a high concentration of salt in the surface soil is the result. If this had occurred in the poorest land it would have been serious enough, but the district as a whole cannot view with complacency the degradation of any part of its most fertile soil type. While the total acreage so affected at present is obviously small, the mere presence of salty patches is likely to result in a depreciation of the value of a property. In reporting on the results of the competition last year a passing reference

Sterile salt-affected patch in ambercane.

was made to the discovery of small salt-affected patches in one paddock, and, on this occasion, in view of the fact that four exhibits showed similar but larger patches, it is in the interests of the community that the subject should be dealt with plainly and at greater length. The matter should be given publicity so that remedial measures may be adopted more quickly. Although great progress in improved methods has been made in the district the progress has been made chiefly on ground which is less expensive to put in order than the box land. A further point is that the drainage of the box land is less efficient in its natural state.

That the Boort Agricultural and Pastoral Society has been concerned with this question, among others, has been shown by the invitation extended to the Department of Agriculture last year to make available the services of its staff of soil chemists to carry out a soil survey in the district. The responsibility for a preliminary survey was allotted to Mr. F. Penman, M.Sc., Assistant Research Chemist, and in his report to the society he recommended a more general adoption of improved methods of irrigating. Since then Mr. Penman has been transferred to munitions work, and no further examinations have been made. This has been a loss to the district, but it is hoped that the experiences of the writer as research officer in the supervision of reclamation work on salt-affected land on four soil types in the Kerang and Cohuna districts will be of some assistance to Boort irrigators. It is felt that, in this report, it will be profitable to discuss the lay-out of land for irrigation in relation to the prevention and cure of salt troubles, as well as in relation to the increase of production from lands not affected by alkali.

At the outset it can be taken as proved that while improper use of irrigation for annual crops has been a big factor in producing salty conditions at Kerang and Cohuna, the reclamation of these lands cannot be effected in any reasonable time except by further irrigation. There is an important difference, however, in that whereas the damage occurs most frequently on lands watered by "flooding" or "ponding" methods carried out on a large scale, or on lands adjoining areas watered by these methods, reclamation without contemporaneous damage to adjoining areas is best secured by watering under the "border" system (or, in special cases, where falls are very steep, by a combination of the "border" system and terracing).

The essential feature in the reclamation of salty land by further irrigation is the quality of the grading. It must be obvious to all that by grading out bumps and depressions greater uniformity of water absorption is secured and the amount of water required to irrigate a given area is decreased. After a few years, depending a good deal on the original depth of surface soil, even growth of crops and pastures is obtained on graded ground. The efficiency of the water applied is increased, and if superphosphate is used as freely as financial resources permit, the highest production possible on any selected soil-type is reached. In this competition documents were produced by one exhibitor showing a gross return of 10s. per cow per week from dairying, which is a wonderful return for the summer months in a dry season. (See report on lucerne competition elsewhere in this issue.)

The value of grading in securing proper drainage is not as frequently in our minds as its benefits of uniform distribution and absorption of water, but, for lucerne especially, the good drainage provided by good grading and proper situation of check-banks is most important. Where salt-affected land is being irrigated, the drainage is even more important. On this land, any surplus remaining on the surface, after an irrigation, represents a further addition of water to soil already overcharged with moisture. If a hole is sunk in this salty land it will soon show water, and within 24 hours the bore may be filled with water to within 2 feet of the natural surface. Worse still, the water in the bore will be, in practically every case, strongly saline. Whenever this saline water is raised and held near the surface by the excessive use of irrigation water, evaporation of the water is likely to concentrate the salt on the surface, and sterile patches which are slimy when damp and powdery when dry will develop. On ungraded ground the crab-hole banks, which invariably receive inadequate watering, will become sterile. In milder cases, the ground does not become sterile but growth is poor and uncertain, and plants often wither up, even when the soil moisture is sufficient for growth in normal soil.

It is unfortunate that the fertile black and grey soils usually require severe grading. The labour involved tends to retard the rate of progress in securing good lay-out, while the fertility of the soil encourages its use under "flooding" conditions of irrigation. To be fair to the exhibitors this year, it must be recorded that the great majority had put in a lot of work with the grader for crops of Japanese millet, Sudan grass, and ambercane. The extent to which further work is necessary will be better realized after considering the following case: One 20-acre section of ambercane, consisting of two large bays, required 16 acre-feet to water it at the second watering (January 23rd), and the drainage from the ambercane was more than sufficient to water 30 acres of Japanese millet adjoining. Supposing that this drainage could not have been profitably used (it was too early to be used on

native pasture), 8 or 9 acre-feet of water would have been wasted, which is a serious enough matter at any time, but much more so in a dry season, and in a district not well served in regard to storages or distributing system. The fact that wasted water is paid for at so much an acre-foot is beside the point, because no irrigator has ever paid the true value of water received.

Ambercane growing on the property of Mr. Ralph Lanyon.

We can now examine the position of the various annual summer fodders in relation to the needs of the district. Considered from any and every angle—cultivation costs, seeding, annual worry about the "strike," labour, carrying capacity (both total carrying and its distribution through the season), cost of water, &c.—only one conclusion can be drawn, namely, when compared with lucerne, annual summer fodders are wasteful in costs of production (labour and water), wasteful under grazing, and so on. As preparatory crops for lucerne land they are excellent, but as permanent practice they are unprogressive.

It is unreasonable to expect that the change-over from these crops to lucerne can be accomplished except through hard work spread over a period of years. Those who do change their methods, however, find that smaller areas of improved land will suffice, and that the work ahead of them shrinks faster than they had anticipated. They usually accelerate their pace because they see how well it pays them. A progressive man is expected to improve the grading before each crop. This most important work should not be left too much at the mercy of the weather; grading should be done during the summer and early autumn in preparation for the next summer's crops.

For the class of grading to be done in the first year or two, no elaborate grader is necessary. If the high places are scooped into the crab-holes and creeky places for a start, a big improvement in efficiency in watering will be gained. In addition, nothing is lost by manuring the summer annuals at a heavier rate than they appear to require. Superphosphate is never washed out or leached down in the soil, but a reserve can be built up for the permanent crop to be sown when the final grading is completed and the land banked in the "border" system.

When a commencement is made with unimproved land there are several arguments against grading and sowing lucerne in the one season. They are the time available for the work, impermanency of such grading because fills sink after watering, and, finally, that places graded off heavily often show for a few years poorer growth than the fills. For how long this will occur depends, in the case of lucerne, on the manuring, watering, and grazing treatment, and these factors are discussed in the report on the lucerne section of the competition appearing elsewhere in this *Journal*.

There is abundant evidence in the experiences of progressive farmers to dispel the idea that emphasis on the importance of lay-out is a mere theoretical fad of the Department of Agriculture and the State Rivers and Water Supply Commission, and we may express a hope that, through grading, those paddocks which are now deteriorating through the flooding of summer annual fodders will soon be put in order to grow lucerne:

"whose luxuriant herbage feeds
The lab'ring ox, mild sheep, and fiery steeds;
Which ev'ry summer, ev'ry thirtieth morn,
Is six times reproduced, and six times shorn."*

* Old Andalusian Poem, translated 1764, by Rev. Harte. Quoted by W. S. Hill, in "The Culture of Lucerne."

The Awards.

In the allotment of points in the summer fodders section it was felt that special subdivision of the points was desirable. Owing to the dry season most of the exhibitors were unable to hold their paddocks from grazing—in

the writer's opinion, except where crops are being reserved for seed (of which little appears to be produced in the district) it is neither desirable nor necessary to save up paddocks for inspection. Japanese millet, for example, shows a rapid decline in palatability to sheep as it gains height, and for best results some temporary subdivision and rotation of grazing at a stage of short growth is the best practice. The alternative, which involves more expense for labour, but solves the problem of our present shortage of cyclone wire, steel posts, &c., is to cut crops, when headed, with a mower and rake up to cart out to dry paddocks for sheep and cows, or to take it off with a binder and cart out to dry areas. It was a regular practice at the Werribee Research Farm to cut green "shandy" with a binder and to chaff it for silage—similarly, any excess of millet could be cut and stacked either green for stack silage or cured for hay. Ensilage is preferable in that the fodder is got out of the way of waterings, especially on the big bays in common use. Check-banks can be utilized if hay is preferred.

Sudan grass can be similarly handled, but heavy and tall crops of ambercane and saccaline present difficulty. The weakness of most summer fodder paddocks is that waste is high and yet at the same time there is a constant worry to keep the feed up to the sheep. More efficient grazing is secured with cattle.

The bulk of feed on a paddock is not necessarily the determining factor in the competition, nor, as suggested by one exhibitor, is the paddock which received the most manure bound to win the first prize. Figures for grazing secured from the paddock were obtained in each case, and have been taken into account

Ambercane exhibited by Messrs. Nunn Bros.

in allotting the points for "yield." Any grading done has been credited under "lay-out," and the attention to watering assessed under "condition." Where grading has had to be severe, an adjustment has been made in the points for "uniformity." As to the different crops competing, the "yield" points have been given on the basis of what percentage of the possible yield for the species on that particular type of soil is represented in the paddock and is judged on strike, stooling, height, &c. It is hoped that this system will meet with general approval.

A section of Japanese millet, exhibited by Messrs. Buchanan Brothers, Yando, was awarded highest points. This was undoubtedly

Exhibitor.	Lay Out.	Uniformity.	Condition, with Reference to Probable Method of Utilization.	Productivity.	Freedom from Weeds.	Total.
Possible	10	10	10	10	10	50
1. Buchanan Bros. (Japanese millet)	3	8½	9	9½	9	39
2. Nunn Bros. (Ambercane) ..	3½	8½	9	8	9½	38½
3. R. H. Lanyon (Ambercane)	3	6½	9	7½	9	35
3. W. R. Slatter (Ambercane)	3	7	9	7	9	
4. L. Boyle (Ambercane) ..	2	7	9	7	9½	34½
5. Sutton Bros. (Ambercane ..	2½	6	9	7	8½	33
5. Hill Bros. (Japanese millet)	2	7	8	7	9	
6. H. J. Dyer (Ambercane) ..	2	6	7	6	9	30

the heaviest crop, considering the species used, of any inspected. However, had it not been for the fact that, by temporary subdivisional fencing and by a demonstration of cutting and feeding out (from the adjoining section) as time permitted—an attempt was being made to reduce the wastage which would occur under grazing conditions—this exhibit would have been marked down in productivity. It had gone a long way past the best feeding stage (of millet) for sheep. In common with all other exhibits in the summer forages section, the lay-out was poor, consisting of large sections surrounded by high scoop-banks and watered by flooding.

The area was intended originally for ambercane, but a sowing made in a dry seed-bed towards the end of October was a failure, for which poor seed was blamed. The effects of the watering given to germinate the ambercane had worn off by December 1st, when millet at the rate of 11 lb. seed was sown with 45 lb. superphosphate per acre in a dry seed-bed. It is probable that a good supply of subsoil moisture materially influenced the "strike" of the millet, which was exceptionally good. No cultivation was done before sowing the millet, the seed and manure being "combined" in. The first watering was done shortly after sowing, and a sprinkling of ambercane came up with the crop. In January, two rains of 90 and 60 points respectively were recorded, and the second watering was done during the second week in January, between these rains. A third watering was done a month later.

No channel was provided along the two bays of 4½ acres each (5 chain x 9 chain), the water being taken on to one section through a single gap at the end of a channel, and excess water from the higher section or bay being drained into the lower. Owing to the watering of other areas being done at the same time, no figures for water used were available.

Some grading had been done, and the effects of this were noticeable, especially on one patch which, to the owners' knowledge, had never before been irrigated. On this area the millet headed out at about 1 foot high.

The soil was heavy, deep, and of the naturally high fertility common to lands heavily timbered or flooded. Unless the sprinkling of ambercane could be classed as a weed in Japanese millet, the exhibit was very free from weeds except for a little hogweed. Allowing for some graded-off areas the growth was tall, dense, and fresh. Practically all the plants were fully headed.

Second place was gained by Messrs. Nunn Brothers, with part of a 22-acre-paddock of ambercane in which 700 sheep were grazing. The only evidence of their presence, however, was the fact that all saffron thistle plants in the rosette stage had been neatly eaten out in the crowns. Like all the ambercane inspected, this section showed some attack by aphis, but it was less severe than usual. To Messrs. Nunn's knowledge the paddock, which is on heavy lignum land, had not been watered for ten years on account of its rough nature. The lignum was cleared, and, after disc-ploughing to 7 inches depth the paddock was graded, cultivated, and sown through a combine, the seed and manure (14 lb. and 60 lb. per acre respectively) being covered by means of the light harrows following the machine.

Two waterings were given; the first, between 19th and 24th December, took 31 acre-feet for a total of 66 acres of Japanese millet, ambercane, and Sudan grass; the second, between 1st and 4th February, took 16·97 acre-feet for a total of 40 acres of Sudan grass and ambercane.

The rows were about 14 inches apart, an occurrence which could not be explained by the exhibitors. Although fresh and succulent, and being grazed, the ambercane was not headed out except in a patch where very little surface soil had been removed during grading. Mr. Nunn has never had any cases of ambercane- or Sudan grass-poisoning on the property, and has never encountered them elsewhere. He considered the feed better when immature and leafy, and stressed the fact that if the expected "break" occurs normally the bulk of the ambercane now being saved will not be required. He estimated that the 22 acres would provide six weeks feed. The saffron thistles referred to earlier were few in number.

2586/41.—3

Live Stock Notes

Reminders for April—May

Compiled by A. C. T. HEWITT, M.Agr.Sc., Live Stock Science Officer

Protein-rich Foodstuffs.

PROTEIN-RICH foodstuffs may be divided into two groups—(1) bulky, and (2) concentrated.

1. BULKY PROTEIN-RICH FODDERS.

Foodstuff.	Dry Matter.	Starch Equivalent.	Protein Equivalent.	Nutritive Ratio.
	%	%	%	1 :
Skim milk	9	8	3.6	1·4
Butter milk	9	9	3.4	1·8
Brewers' grains ..	25	13	3.6	3·6
Pasture—short, green, succulent	20	14	4·5	2·3
Clovers, before blooming	17	8	2·4	3·0
Lucerne, in early flower	24	9	2·5	3·2
Rape	14	6	2·0	2·3
Peas	20	9	2·2	3·5

This group contains skim-milk, butter-milk, fresh brewers' grains, and nearly all short, green, succulent forage plants. The average food values are shown in the above table, but there is considerable variation between samples.

On account of the large amount of moisture in these foodstuffs and the rapidity with which they deteriorate, it is essential that they be fed close to where they are produced. Skim-milk and butter-milk are excellent foodstuffs and form the principal protein supplements for pigs and calves. Brewers' grains and the succulent forage plants form the principal protein supplements for all grazed animals and, to a lesser extent, supply some protein for pigs and poultry.

Closely-grazed, immature, succulent forage plants and brewers' grains are remarkable stimulants for high milk production. Under their stimulus most dairy cows will maintain high milk yields and yet waste in condition, constitutional energy, and disease resistance until they eventually break down unless they are also receiving sufficient energy-producing food. Hay or chaff helps to supply such energy, but it is advisable to give all very high-producing cows some additional energy-producing concentrate such as ground grain.

As the plants approach maturity, forage crops form a more complete ration for dairy cows which, provided they are able to graze sufficient herbage, will milk well and maintain condition at the same time. After the grass or green forage has matured, it contains insufficient protein to maintain milk production, although animals will fatten on it. A protein-rich supplement then becomes necessary.

2. CONCENTRATED PROTEIN-RICH FODDERS.

Foodstuff.	Dry Matter.	Starch Equivalent.	Protein Equivalent.	Nutritive Ratio.
	%	%	%	1 :
Blood meal	90	66	65·0	..
Meat meal	90	84	54·5	..
Fish meal	87	59	53·5	..
Peanut meal	93	78	42·6	0·9
Cotton seed meal ..	90	70	33·0	1·3
Dried butter milk ..	90	85	30·4	2·0
Dried separated milk ..	90	79	28·5	2·0
Rape seed meal ..	91	60	27·0	1·3
Linseed meal ..	89	72	23·7	2·1
Linseed meal, extracted	89	61	23·7	1·7
Vetches, grain ..	87	70	21·5	2·3
Maize gluten feed ..	93	78	20·5	2·8
Peas, grain	86	69	18·2	2·8

The concentrated protein-rich foods all have a high energy value (starch equivalent) in addition to a high protein equivalent. Proteins of animal origin such as those found in skim-milk, butter-milk, meat-, blood-, or fish-meals, are known as "high quality" proteins, because they contain all the necessary amino acids or units required for rebuilding animal tissues, for growth, for reproduction, and for the production of milk, eggs, wool, &c. Twenty-two different amino acids are known, and certain ones which are necessary for animal maintenance and production are sometimes rare in proteins of vegetable origin.

Lysine, an amino acid necessary for growth and production in animals, is deficient in the proteins of pasture and cereal hay or grain, but it is abundant in skim-milk, meat-meal, &c. Cystine, an amino acid necessary for wool growth, is also abundant in the animal by-products. An article on feeding meat-meal will appear in a subsequent issue of this *Journal*. Although dried butter-milk and dried separated milk are used to some extent in the rearing of chickens, they are too expensive to recommend for general feeding.

In addition to the high quality of the protein of the foods already mentioned, some of the other protein-rich concentrates also have special qualities; for instance, peanut-, cotton-seed-, and linseed-meals are very palatable and are usually relished by all classes of stock. Cotton-seed-meal is very binding and suitable for feeding with fodders that tend to scour, while linseed-meal is laxative and very valuable for feeding with fodders that bind. Rapeseed-meal often contains quantities of mustard oil which, when present, restricts the use of rapeseed-meal to about 10 per cent. of the ration or 3 lb. per cow per day.

These concentrates can be fed to all farm animals, and their relative monetary values are more or less in proportion to their protein equivalents, due allowance being made for their high starch equivalent.

Dairy Cattle.

Many tasks, such as top-dressing, sowing cereal hay crops, and making maize silage, have to be attended to at this time of year. The amount of work in the milking shed, however, is reduced, many cows being dried off for a spell prior to recalving from late June onwards, and there are few, if any, calves now to be fed on most farms. The time is opportune for renovating buildings, yards, and roadways.

In recent years many farmers have put down concrete standing yards adjacent to the milking sheds, resulting in increased efficiency and convenience. When laying out a yard, 14 square feet at least should be allowed for each dehorned cow yarded at the one time. For a herd of 50 cows a yard 20 feet x 35 feet would be required. To cover this with concrete 4 inches thick, 230 cubic feet or 8½ cubic yards of concrete are necessary.

The quantity of cement required would depend upon the nature of the sand and gravel used. When clean sand and screenings are used, a concrete mixture containing 1 part of cement, 2 parts of sand, and 4 parts of screenings can be used.

For a yard 20 feet x 35 feet x 4 inches, requiring 230 cubic feet of concrete, the following materials will be required:—50 paper bags of cement, 3¾ cubic yards of sand, and 7½ cubic yards of screenings.

The yard should be built in sections, so that any cracks occurring will take the form of a small opening or closing of the joins between the sections of concrete. Such a yard could be constructed in ten sections each 7 feet x 10 feet, or twenty sections each 7 feet x 5 feet.

If possible, the drains should be designed in such a way that the effluents can be irrigated over the greatest area of pasture. As some fertilizers are unprocurable and others are becoming more expensive, every effort should be made to utilize all manure produced on the farm.

Horses.

Bonus for Foals from Draught Horses.

Owners of draught mares are advised that the Victorian State Government has approved of a bonus of £2 for every foal the progeny of a registered Clydesdale, Suffolk Punch, or Percheron stallion and a mare approved by officers of this Department. The term "registered stallion" refers to one registered under the *Horse Breeding Act* 1928. The bonus is payable in the coming season.

[W. D. Shew, G.M.V.C., B.V.Sc., Senior Veterinary Officer.]

Sheep.

Those stud breeders who contemplate exhibiting their animals should select their most likely show animals and commence preliminary preparation on them.

Breeders of stud flocks are advised to draft out all those rams showing promise. These rams should be given special care and attention so that they can be presented to buyers in the best order. Sheep of quality always find a good market at the early sales held later on in the year.

Crutching should now be well in hand, and where fly has been troublesome early crutching is essential in its control. Where fly has been very bad, a second crutching is advisable.

[N. A. Bowman, Sheep and Wool Expert.]

Pigs.

Baconer and Porker Competitions.

The competitions for recorded litters of baconer and porker pigs which were inaugurated last year are to be repeated in 1941.

The competitions are open to the progeny of pure-bred registered boars and sows.

Litters for the baconer class should be farrowed during March and April, and porker litters about two months later.

The birth dates and the weights of the litters at weaning will be officially recorded by officers of the Department of Agriculture.

When the two pigs representing each litter entered are shown and slaughtered for the carcass test, points will be awarded for the total litter weight at eight weeks old, the rate of growth of the two pigs up to the time of slaughter, and the carcass quality of the pig selected for slaughter.

Although the competitions are restricted to breeders of pure-bred pigs, they provide much interesting and useful information for all pig breeders relative to the production capacity and carcass quality of particular boars and sows, and the exhibition of pigs and carcasses at the Melbourne City Abattoirs last year was an object lesson to all who attended.

An equally interesting exhibition and sale of stud pigs is expected to be held next September.

[L. A. Downey, H.D.A., Pig Expert.]

Poultry.

Selecting Breeding Stock for Egg Production.

The selection of breeding stock for the coming season, and the mating of the birds, is one of the most important undertakings of the year. The success of the whole season depends on the judgment displayed in placing the right birds together. This can be properly carried out only by those with the necessary experience.

There are no definite methods of estimating either the number of eggs a bird of normal appearance has laid or will lay, without keeping a special record of its performance, or what desired qualities a bird of either sex will transmit to its progeny. Egg production records and progeny tests, therefore, are essential to assist in the selection of breeders.

A bird (male or female) should appear bright, active, and healthy. It should be mature, well developed, of normal size, and have a vigorous constitution. The eye should be full, prominent, and bright. The bird should have a good depth of body, with a long, broad back and a straight breastbone. It should be tight in feather, and free from any constitutional weaknesses, deformities, or other external faults. The females should give evidence of ability to lay a large number of eggs of the required size, shape, and texture of shell. Both sexes should be bred from a family of high egg producers with similar qualities.

[H. F. Clinton, Poultry Expert.]

Bees.

Blossom this season is restricted and irregular throughout the whole State, and prospects of even a fair flow of honey during the autumn are not bright, while in many districts it appears that bees will be actually short of feed in the winter. As the honey-gathering season is nearly finished, a reserve of at least 25 lb. to 30 lb. of honey should be left in each colony for winter food.

April and May are opportune months for detecting any disease in the brood combs, since the gradual decline of brood rearing affords the apiarist a clearer chance of noticing cells which have failed to hatch. Pamphlets giving details of brood diseases may be obtained, free of cost, on request to the Superintendent of Livestock, Department of Agriculture, Melbourne.

Hives with failing queens should be united to stronger ones, although, in districts experiencing good conditions, it still may be possible to raise queens in time to obtain enough young bees to carry the colony through the winter.

To conserve warmth, supers not being used by the bees should be removed and the lids of all hives made weatherproof.

[J. S. Eagland and J. W. Thomlinson, Apiary Inspectors.]

The Fungicides Act

Pest Destroyers Registered for 1941

By W. C. ROBERTSON, Chemist.

THE Fungicides Act of 1928 (No. 3688) as amended by the *Fungicides Act* 1935 (No. 4295) permits the sale of any pest destroyer which is registered under the Act. It is required that the pest destroyer (fungicide, insecticide, vermin or weed destroyer) be registered annually with the Department of Agriculture, and in the application for registration the distinguishing brand name and the percentage of the active ingredient must be stated.

The Act also gives power for standards to be prescribed for any pest destroyer and where a standard is prescribed the quality of the standardized article sold must comply with the prescribed standard. All parcels containing any pest destroyer are required to be branded or stamped with the distinguishing brand name and the percentage of the active constituents. Inspectors appointed under the Act are empowered to inspect factories, stores, &c., in which pest destroyers are kept for sale for the purpose of examining the parcels containing any pest destroyer and obtaining samples for analysis.

These are the main clauses in the Act from the farmers' standpoint and they constitute a warranty as to quality. It is the policy of the Department through the work of inspecting officers and the analyses in the laboratory of samples collected or submitted, to maintain supervision over the pest destroyers registered, more particularly as regards quality.

However, this does not mean that every parcel of pest destroyer sold is subjected to inspection and analysis prior to delivery and it is necessary for the user, be he orchardist, market gardener, farmer, grazier, or floriculturist, to exercise some supervision over his purchases under the Act.

A casual glance at the guaranteeing label is insufficient. A close inspection of the contents of the package will provide the usual commonsense information. For example, the incorrect labelling of Bordeaux Powder as Lead Arsenate Powder can be readily detected by a passing glance.

The procedure, in any case of this description, should be to communicate with the manufacturer and have the matter rectified.

Should the case be somewhat more difficult of detection, and suspicion be aroused during or after using the pest destroyer, the procedure laid down in the Regulations under the Act should be followed, i.e., any purchaser of a pest destroyer desiring an analysis of the material purchased shall within fourteen days of the delivery of the fungicide, insecticide, vermin destroyer or weed destroyer, give written notice to the vendor selling such pest destroyer of his intention to have the same analysed and in such notice shall offer to divide into three parts at any time within seven days, in the presence of the vendor or his agent, a sample from an unopened package of the said pest destroyer. If required by the vendor or his agent so to do, the purchaser shall forthwith make such division, and shall (*a*) place each part in a glass vessel and properly mark and seal same; (*b*) deliver one such parcel to the vendor or his agent; (*c*) retain one of the parts for future comparison; and (*d*) submit the third part either by hand or through the post as a registered parcel to the Chemist of the Department of Agriculture, Melbourne, or an analyst appointed under the *Fungicides Act* 1928.

If the vendor or his agent does not, within fourteen days after service of such notice, accept the offer of the purchaser to divide a sample of the pest destroyer in his presence, or in that of his agent, or does not attend personally or by agent, at any time and place appointed by the purchaser for such division, the purchaser may forthwith, but not later than one month after such service send a sample thereof to the Chemist of the Department of Agriculture, Melbourne, or an analyst appointed under the *Fungicides Act* 1928, for analysis.

The fee for such analysis is ten shillings and sixpence per each constituent estimated or two guineas, whichever is the lesser.

The list of registered brands for the current year contains more than 430 brand names, but the majority of these are of little interest to the man on the land.

The orchardist purchases sprays or spray-making chemicals such as Lead Arsenate, Lime

Sulphur, Colloidal Sulphur, Copper Sulphate, Chemical Lime, Nicotine Sulphate, Tar Distillate and spraying oils.

The market gardener uses the same spray materials in the form of dusts (although in some instances wet spraying is practised) with the inclusion of Derris Root in recent isolated instances.

Main purchases by graziers are arsenical or arsenical-sulphur compounds or a combination of both with or without Tar Acids for the purpose of dipping sheep.

It is interesting to note that the majority of sheep dips are now including the extract of Derris Root in their formula, apparently with good effect.

Sheep men are keen buyers of preparations for the control of the blowfly maggot while farmers in general make purchases of all the foregoing, more or less, and in addition are constant buyers of weed destroyers, basic copper carbonate, and other copper compounds used as fungicides in seed dressing, &c., arsenical oxides for the destruction of timber and vermin, organic mercury compounds which have recently come to the fore as fungicides and other incidental chemicals or preparations which are of lesser importance.

The floriculturist and home gardener also received the protection of the Act in their constant fight against insect pests and plant diseases.

Surveying the list of the 430 brands of pest destroyers registered, it will be observed (i) that the main pest destroyers are of ancient origin, and (ii) that they are not at all extensive—as a matter of fact, they may be counted on the fingers of the hands.

Included in the list are two brands of dry lime sulphur (which must not be confused with dry-mix lime and sulphur). This product is now being manufactured in Australia and on the analyses registered, the local product is of superior quality to the imported.

Inquiries are persistent as to how dry lime sulphur compares with the standardized liquid of which twelve brands are registered.

The standard for liquid lime-sulphur in total soluble sulphur is 28 per cent. (weight in volume) while the average guarantee for the dry powder is 58 per cent.

The percentage weight in volume is equivalent to pounds in 10 gallons which means that one gallon of liquid lime-sulphur contains 2.8 lb. of soluble sulphur. Therefore to obtain 2.8 grams of soluble sulphur in the form of dry lime sulphur to make one gallon of the standard liquid, it will be necessary to use approximately 5 lb. of the powder, as in simple proportion, 100 lb. of dry powder contains 58 lb. of soluble sulphur, how much will contain 2.8 lb.:—

$$\frac{2.8 \times 100}{58} = 5 \text{ lb.}$$

Combined Lead Arsenate-Lime Sulphur Spray.

While the use of the abovementioned combination is not recommended, there are many who under certain circumstances, include it in their spray schedule and the latest system practised abroad to deter the scorch due to the chemical reaction of the combined spray, is to include two ounces of manganese sulphate to every 100 gallons of the diluted spray mixture.

In conclusion readers are informed that copies of the registrations under the Fungicides Act for the current year, are now available in leaflet form, free of charge on application to the Chemist for Agriculture, State Laboratories, Gisborne-street, Melbourne, C.2.

Manuring Irrigated Pastures

Superphosphate in liberal amounts has proved itself to be the best manure for irrigated pastures.

In carefully controlled tests at the State Research Farm, Werribee, it has been demonstrated that, even with an annual dressing as high as 4 cwt. of superphosphate, the limit of profitable application had not been reached. So that it pays to be liberal when applying superphosphate.

Another test at Werribee showed that it was not necessary to split up the annual dressing, and apply, say half in the autumn, and the rest in the spring, as no extra response was obtained by so doing. Therefore, if possible, get the full amount on in one operation, and keep the cost of application to a minimum.

Should circumstances prevent the manure being applied in the autumn, the full amount should be applied when circumstances permit, because, although the autumn is the usual time for top-dressing, it is not the time of application that is the really important factor, but rather, that the pasture gets a dressing of superphosphate at some time during the year.

Lucerne for Non-Irrigation Areas in the Wheat Belt

By L. C. BARTELS, B.Agr.Sc., Senior Agrostologist

LUCERNE is a plant of outstanding value as a pasture element for the drier areas of Victoria. This is not generally appreciated because, although lucerne is regarded as an excellent fodder crop, it is generally associated with irrigation in the arid districts, or with the rich soils of river valleys in the regions where summer rains are frequent. Lucerne requires an abundance of water and well-drained soils for its best development, but it is a very deep-rooting plant and combines an ability to luxuriate with warmth and moisture with wonderful resistance to dryness. It is one of the most drought-resistant pasture plants available to us.

Many farmers have used lucerne to great advantage, but there are extensive areas where more could be grown successfully. This applies to many parts of the wheat belt on border Mallee country and even in the better Mallee areas. It is of great importance at any time, but particularly now when farmers are turning their thoughts to pasture improvement, and have only a limited choice of pasture species suitable for zones of rainfall below 20 inches.

Lucerne is outstanding amongst these species, and there are so many examples of the successful development of lucerne without irrigation in northern Victoria that an extension may be confidently advocated.

The main features of lucerne which commend it are as follow:—

It is a perennial leguminous plant, with a capacity for high production of nutritious fodder over many years; it is deep rooting and has great resistance to dryness; its roots can penetrate the sandy loam soils of the north-west, and it endures under conditions that kill many other plants; it is a summer grower and makes rapid response to monsoonal rains which often occur; it provides a green picking of feed at times when such feed is very scarce, and this gives it particular value; it supplements winter and spring fodders and the dry residues available in summer and enhances their value.

It is a soil improver and, in conjunction with the stock grazed on it, can be an important agent in regenerating soil fertility reduced by exhaustive farming practices. Once established it is able to withstand soil drift and will help to stabilize soils liable to wind erosion.

There are so many examples of successful trials with lucerne in non-irrigation areas that one wonders why more farmers in the north do not undertake to lay down at least a small area. Perhaps some have tried and failed to establish it, but in that case they should consider whether they gave it a fair chance. Lucerne is rather delicate in the seedling stage, and it deserves a good start. A clean, firm seed bed should be obtained by extended preparation, and the chances of success are greatest if it is sown on carefully-worked fallow. It is inviting failure to sow lucerne on a hastily-prepared seed bed. Some farmers may be deterred by considerations of cost, but it should be known that only light seedings—as little as 2 lb. per acre of good seed—suffice to establish lucerne in the wheat areas. Perhaps this will be better understood if one knows that 1 lb. of lucerne per acre is equivalent to more than five seeds per square foot, and that is more than can be sustained under low rainfall.

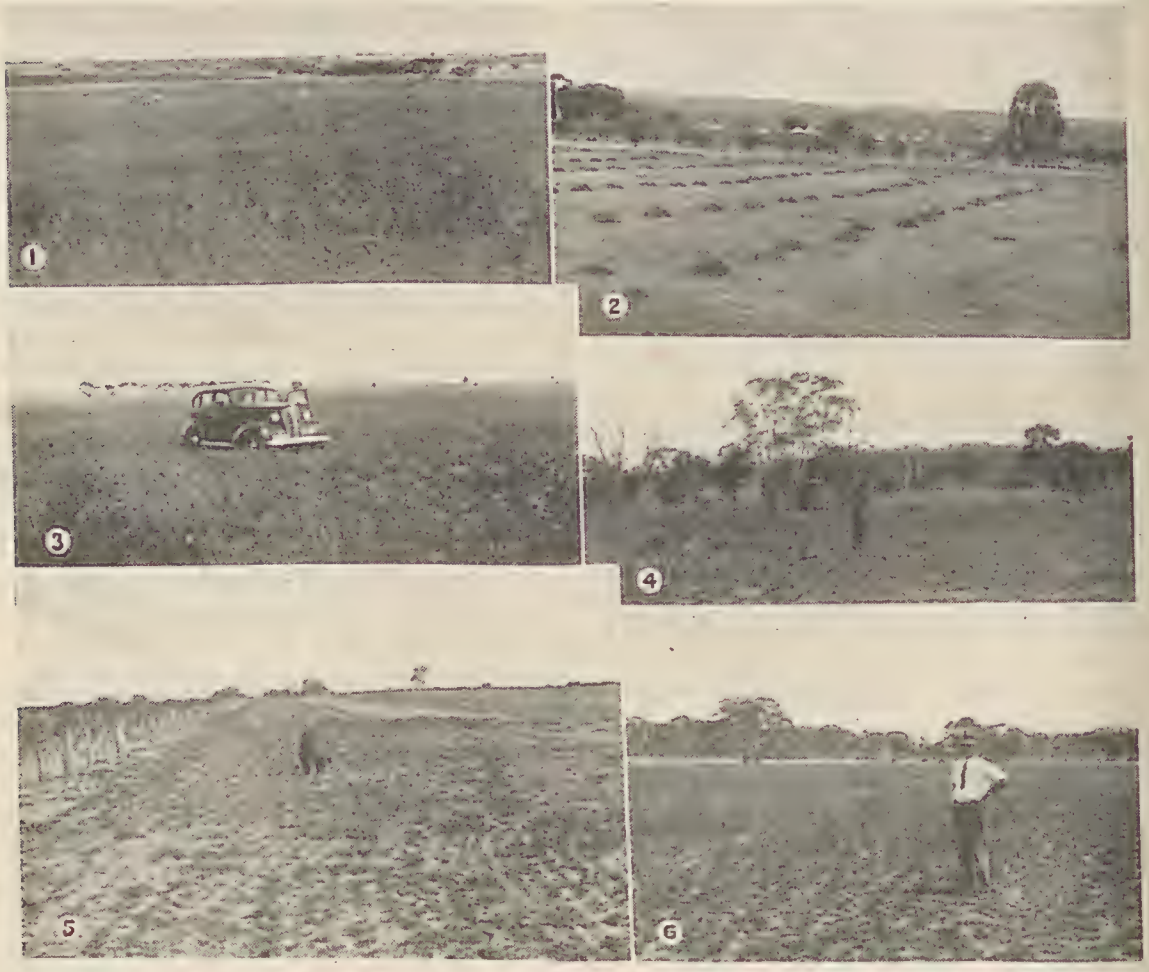
Moreover, it has been shown that under border Mallee conditions at least it is quite practicable to establish lucerne under cover of a light seeding of wheat; in fact, it may be said that the shelter afforded by the wheat plants against drifting sand outweighs the harmful effects of the competition.

It is likely, however, that most failures with lucerne arise through bad management—abuses by overgrazing and failure to top-dress. Despite its great productivity, lucerne is sensitive to overgrazing, and, because it presents a green "bite" at times when green feed

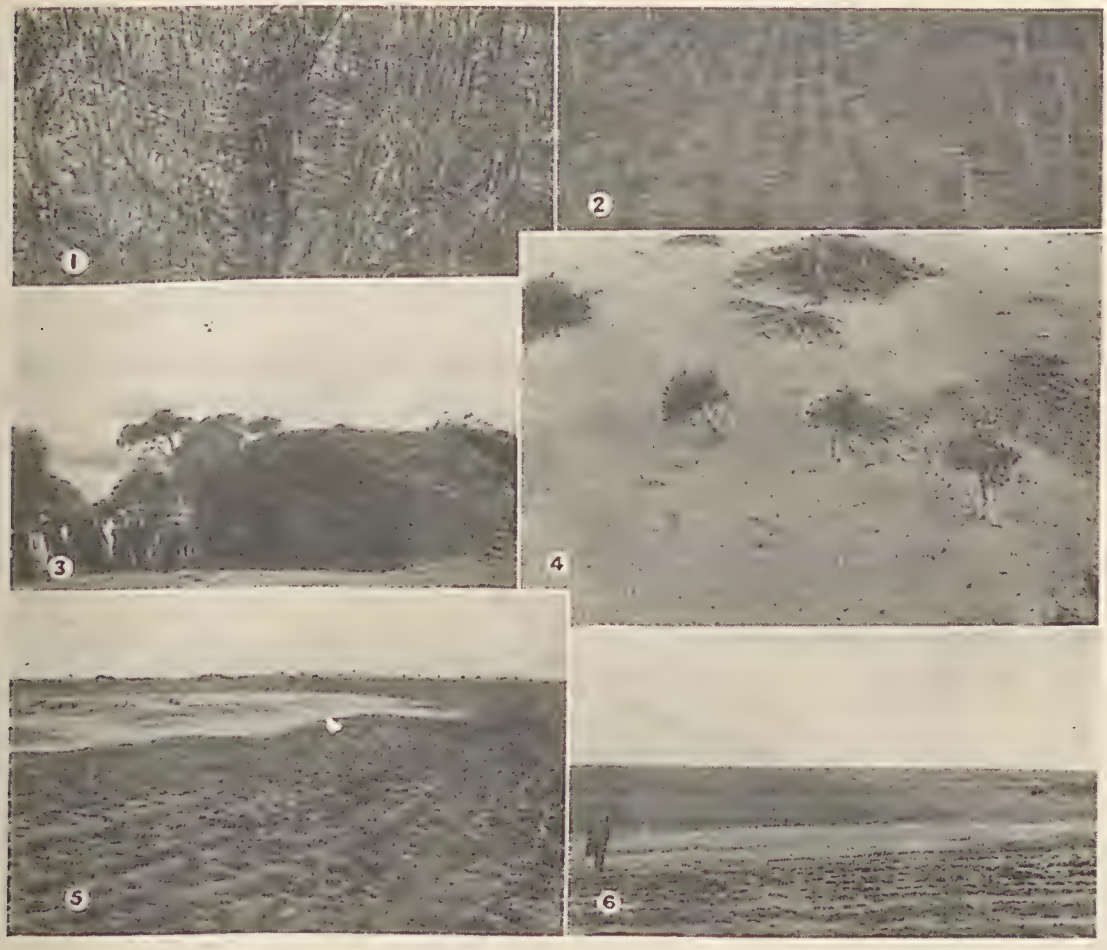
normally is so scarce, it is likely to be persecuted for its enterprise and eaten out. It should be plain to any one that if lucerne is to maintain its vitality and to strengthen its root system it must be allowed to develop leaves, to "breathe," and to build up necessary plant food from the air. This implies resting periods between grazing periods during which the lucerne is allowed to grow even to the early flowering stage—if there is sufficient moisture.

Lucerne should be top-dressed with superphosphate, and it will pay to give 1 cwt. per acre every year. This will offset the heavy drain represented by the maintenance of sheep and the production of lambs. Few wheat farmers dispute the need for superphosphate now. Many apparently do not realize that the soil cannot sustain good pasture plants unless manured. If they have a stand of lucerne they should top-dress it, and they will extend its life, fortify it against any harm from grazing, enable it to combat weeds and pests, enhance its feeding value, and stimulate growth in the lean periods of the year.

Lucerne will suppress plants like stinkwort and any other weed which tends to infest land in the wheat areas. In New South Wales it has been sown in competition with skeleton weed, and it is recommended for areas where hoary cress has spread. Over an extended period Mr. W. N. Muntz has progressively sown lucerne on Mallee fringe land at Antwerp,



The above photographs indicate the range of country in the lighter rainfall areas of Victoria in which lucerne is successfully grown. 1. Antwerp (average rainfall 14 inches); 2. Loddon River flats; 3. Donald (16 in.); 4. Rheola (18 in.); 5. Propodollah, north of Nhill (15 in.); 6. Logan, near St. Arnaud (18 in.).



1. A row of young lucerne in wheat stubble; 2. Lucerne successfully established under cover of a wheat crop; 3. A stack of straw and lucerne cut from wheat stubble after stripping; 4. Lucerne in the Antwerp district persisting in spite of wind scouring; 5. Lucerne on a limestone ridge in Mallee fringe country (note growth right up to edge of limestone quarry); 6. Productive lucerne on loose sand. In this instance the plant has an added value in restricting erosion.

near Dimboola, and now has hundreds of acres which have so completely altered his farm that it has been able to carry upwards of two sheep per acre. Commencing in 1935, he has put in lucerne with wheat on fallow, sowing the seed from a grass seed attachment on the combine when sowing wheat.

Mr. Muntz says that fallowing is a prerequisite for the successful establishment of lucerne. He favours May sowing, and considers that 2 lb. of lucerne per acre is a desirable rate of sowing. The rate of sowing wheat should be reduced to 1 bushel per acre with 90 lb. of super. This lucerne at Dimboola is top-dressed in succeeding years with 1 cwt. of super. per acre. Although it may be conceded that the land is above average Mallee, the lucerne is firmly established on limestone ridges on the property, representative of hundreds of thousands of acres in that part of the State. The admixture of young lucerne with the wheat stubble has been cut with a binder and used for winter feeding of stock, and was of particular value in 1938.

In view of the low cost involved in following this practice, there is not much financial risk attendant on attempts to establish lucerne under similar conditions.

MANAGING THE LUCERNE STAND

Results at Boort

Report of the Judge,

A. MORGAN, B.Agr.Sc., Irrigation Field Officer

AS far as could be ascertained, no lucerne has been sown in the Boort district in recent times except on land properly laid out. Superphosphate is being applied at the rate of one bag or more per acre, and the recent introduction of a rotation system which supplies one-tenth of the water-right to each property at intervals of about fifteen days has solved many problems in maintaining the soil moisture in a suitable relationship to the plants.

During the judging of the lucerne competition at Boort, one heard nothing but praise for the productivity of lucerne. Other points about which there was some speculation were, how long the effects of grading should be apparent, why heavily-graded patches do not make good growth, whether it pays to put in subdivisional fencing, how long can lucerne stand up to grazing, and so on. All of these aspects of lucerne-growing are important, but, averaging all the conditions likely to be met, the manuring remains the most important. The reports of previous competitions have reiterated this fact, and supplied additional evidence from the results being obtained in the district. On this occasion it is enough to make a brief statement that lucerne does best with two bags or more of superphosphate per acre each year, and that this can be put on at any convenient time without any material difference. As one successful irrigator has said, "Let me urge you to try this experiment, which I assure you is no speculation but an assured investment of capital, and to top-dress with 1, or, better still, 2 cwt. per acre on dry farms, and on irrigation land 4 cwt. per acre of superphosphate, and your returns will be manifold. It may be asked, 'Why 2 cwt. on dry land and 4 cwt. on irrigated land, as recommended?' The reply is that the increased growth on irrigated land will remove more phosphates just in proportion to the amount of feed produced with water as against that produced without extra water, and the larger removal must be replaced by the larger application."

That this experience in the Boort district provided no exception to the rule has been shown by the general adoption of top-dressing of lucerne. Mr. E. T. Beruldsen, reporting the 1938 competition, describes top-dressing being carried out on one property, using a broadcaster on a motor truck, at the rate of 3 bags per acre (= 5 cwt./ac.). The success which regular, continued and liberal manuring has achieved in these and other competitions has often prompted the criticism that the best-manured paddocks always get the prizes. This usually is so, because the lightly manured stands are inferior.

As for subdivision, there is no particular virtue in putting up fences unless they are put to the right use. It has been said that "Lucerne, truly the king of fodders, never was and never will be the king of grazing propositions, for lucerne rebels against grazing, and if the life of the stand is to be prolonged it must be mown." On the larger properties, where lucerne is used to span the dead period of subterranean clover pastures, it is usually impracticable to reserve the lucerne entirely for mowing. Similarly, on dairying properties there is the necessity (chiefly because of labour problems) to compromise between grazing and mowing. Under these circumstances the life of a lucerne paddock may be shortened, but the worst features of repeated and prolonged grazings are avoided.

In some cases, however, a system of mowing followed by cleaning up rather too thoroughly with sheep appears to be having a bad effect in retarding the growth of short patches of lucerne, which are typical of parts which have been heavily graded or are patches of poorer land. These are more apparent when the time taken to prepare the ground (grading, &c.) is short, perhaps only one season. In the first

place, all litter likely to assist in the formation of a protective layer or humus in the surface soil is removed by the sheep.

The short patches, a photograph of which appeared in last year's report, published in the June, 1940, number of this *Journal,* are relished by the stock, especially sheep, more so than the long patches. If the period of grazing is an extended one, as it is likely to be where a total of two or three hundred ewes and/or lambs are turned into a paddock of 20 or 30 acres, and the stock still have plenty of feed left at the end of a week or more of grazing, then the short patches are punished to such an extent that they show poor growth time after time. With a long grazing the sheep return to them and eat new shoots, further reducing the vitality of the plants. In addition, these short over-grazed patches usually take water less readily and dry out more quickly because of the lack of cover to prevent evaporation. It may seem a good plan to put some obstruction to the flow of water, such as a cross-bank, to enforce better penetration, but this method is bound to lead to trouble eventually, especially if the waterings are frequent. To even up the production from the short and long patches, where grazing of lucerne cannot be dispensed with in favour of mowing, subdivision which will enable the sheep to be rotated on paddocks of a size that can be grazed quickly and evenly is the ideal arrangement.

Few people realize that in addition to shortening the life of the stand, a poor system of grazing may reduce the production of the lucerne even when it is young and should be in its most vigorous years. An American experiment of cutting and feeding as greenstuff versus grazing showed that lucerne cut and fed out green to cows gave an average of ·71 acre required per cow, while the same lucerne grazed for an equal period kept only one cow to 3·63 acres. This seems an extreme case, but it is undeniable that some reduction in yield occurs under grazing. Even in the Boort district the methods adopted by Mr. P. F. Stocks demonstrate that intensive management gives results greatly superior to unrestricted grazing.

It is worth noting, also, that the occurrence of pulpy kidney, bloat, and feed taints in dairy produce can often be found associated with the grazing of immature lucerne, or lack of care in grazing. For safety as well as for maximum yield, combined with good quality, a good proportion of flowers should be showing before stock are turned in on lucerne. Experiments have shown that the best hay is made from lucerne one-tenth in bloom, but for grazing purposes a later stage of flowering is usually desirable. For the control of pulpy kidney it is advisable for ewes and lambs to have access to some sort of hay, or to have the run of a dry area as well as the lucerne. Feed taints can be controlled by taking the cows off the lucerne for an hour or two before milking. Bloat can be countered by limiting the time of grazing of cows known to be subject to it. Management can reduce these troubles, if not eliminate them. Without satisfactory subdivision, however, the problems of grazing management, accumulation of reserves of hay, watering, and so on, are aggravated.

Where additional fencing allows conservation of some of the lucerne as hay, the question of stacking versus pressing may rise, and it seems that pressing has an appeal, because of convenience of handling and storage. Loss of leaf is an important point when conserving lucerne, since the leaves, weight for weight, many contain three times as much protein as the stems, and in general the saving of the leaf is better with baling than with stacking. A press shared between two properties is a good investment, if the arrangement includes an interchange of labour to work the plant. Mr. J. D. Fyfe, who has had plenty of experience in pressing lucerne, is of the opinion that the production of heavy growth by two waterings between cuts is not as satisfactory as lighter cuts obtained with one watering; this is partly because of convenience in handling the shorter growth, and partly because the finer-stemmed shorter growth is leafier and of superior quality.

The natural fertility of some soils is too limited for successful lucerne-growing for hay, but this type of land is usually inexpensive to grade, and is for that reason attractive to the beginner. Some red plain is good, but in general its water-absorbing quality is poor (about 2 inches), and it is best suited to Wimmera rye grass and subterranean clover. It is more profitable, in the long run, to put extra work into the grading of grey or black land, where stands suitable for hay can be grown without too frequent watering. This land when graded takes about 4 inches at a watering, and responds well to superphosphate. If it is decided to grow lucerne on red plain, a campaign of heavy top-dressing is necessary to build up the fertility and encourage the formation of humus. A few years in subterranean clover will put such soil into better heart for lucerne growing.

On medium to good soil in the district, now that the water supply has been improved in frequency by the rotation system, there is no reason why a type of mixed pasture consisting of lucerne, subterranean clover, perennial rye grass, and paspalum cannot be successfully grown for grazing and a cut of clover hay in the spring. This mixture is already giving good results on poor soil in the Murrabit district, as long as the watering is sustained. The mixture was sown in the autumn, and the paspalum came away well, giving plants about 6 inches diameter by the following January. The mixture recommended is :—

Clunes perennial rye grass (certified)	6 lb./ac.
Lucerne	4 lb./ac.
Paspalum	4 lb./ac.
Subterranean clover (certified at Mt. Barker or Tallarook strain)	3 lb./ac. or more.

The light seeding of rye grass is desirable to avoid the choking out of the slower-growing paspalum in the first spring, especially if good rains occur and the paddock is not kept fed off at intervals. After the fertility has been built up by the subterranean clover and superphosphate, it might be possible to introduce some strawberry or white clover, but in the Boort district the use of perennial clovers is not recommended, except on very fertile land close to the wheel-meters. It is not suggested that this development should take place in preference to the highly successful partnership of paddocks of subterranean clover supplemented by lucerne paddocks.

In the course of the judging some adverse criticism of paspalum was encountered. Like every other grass it has its virtues and disadvantages. By itself it is a poor fodder for fattening and milking, but in a mixture with clovers it makes an excellent summer pasture. This is shown at Cohuna, where paddocks are carrying a cow to the acre through the summer.

Those who have graded up land for lucerne are now pondering the advisability of autumn versus spring sowing, rate to sow per acre, and related subjects. Autumn sowing can give good results provided the ground has been cleaned of weeds, and provided the sowing is done in time to allow another watering if necessary before the season ends. Sowing in cold ground is not successful, and it is generally safer to wait till August if the autumn sowing is not attempted. Eight pounds per acre is a sufficient seeding, and will give a good strike if sown shallowly. It is best to keep the points of the drill out and let the hoses hang loose, covering the seed by dragging a chain, &c. Full details in regard to sowing can be obtained in a leaflet issued by the Department of Agriculture, and many valuable hints on this and other aspects of irrigation will be found in Commissioner H. Hanslow's pamphlet, entitled "Better Irrigation," which is obtainable free at every district office of the State Rivers and Water Supply Commission.

Land in the natural state adjoining irrigated lucerne and pasture paddocks.

The winning entry was one of two submitted by Mr. L. Weaver. It comprised about half of a paddock of 16 acres, the two sections of which, although not marked off by any temporary fencing, have independent lay-outs suited to the fall of the land in each part. The border system has been used, with ½-chain bays 12 chains long. This season is its fourth since it was established, and since 1937 Mr. Weaver has been convinced of the value of heavy top-dressing, and has applied at least two bags per acre each year.

There is a total of 75 acres of lucerne on the block, and this provided for the requirements of 26 horses and 1,500 sheep (including lambs) during the summer. Ewes are being

A good stand of lucerne on the property of Mr. L. E. Weaver.

fed with baled lucerne, owing to the exigencies of the season, and to date 800 lambs have been sent away. Top price received was 25s. 4d., and some shorn lambs brought 15s.

Complete and accurate records for this particular section were difficult to separate from general records of the whole of the area laid down in lucerne, but the following particulars will give a good indication of the treatment of the stand.

Waterings were given during the periods September 13 to 22, November 3 to 11, December 7 to 10, January 1 to 6, January 14 to 29, February 6 to 10 (dates supplied by Mr. C. Gallop, District Engineer of the State Rivers and Water Supply Commission, from channel-guards records).

Grazing was with 500 sheep for three days after the first cut, and with 250 sheep for seven days after the second cut. (These figures are for the 16 acres.)

Cuts made on the exhibit yielded 175 bales in the first and 127 in the second.

It is clear that the area has been highly productive, but, comparing the uniformity of the exhibit with that shown at previous inspections, the hard grazing following the mowings appears to have accentuated the short patches.

When judged, the lucerne was fresh in appearance and at an ideal maturity stage for the third cut, which is anticipated to give a very fine quality hay. No weeds were noticed, and the channel also was fairly free of grass and weed-growth. Concrete stops have been installed because of a quick fall in the channel, but it should be noted that the presence of these has not been responsible for the high number of points obtained for lay-out. This was allotted for the excellent grading, clean channel, and suitable width and length of runs. If no provision had been made for control of water in the channel, however, points would have been deducted. Head-ditches with only slight falls, unless they are particularly long, do not require stops.

Second place was secured by Mr. V. H. Lanyon, with one point less in the total allotment. This was deducted for slightly less desirable condition in regard to stage of maturity, and because the stalks left by the stock at a previous grazing were still evident.

Sowing was made in April, 1934, on fallow, using 10 lb. of seed and 80 lb. of superphosphate with a cover crop of ½-bushel of oats. Subsequent manuring has been 2 cwt. per acre each year. The paddock, since subdivided, is notable for its steep slope, and the bays, about one-third of a chain in width at the head-ditch, spread out fanwise. Practically all the bank in each check is covered with lucerne, and except for a proportion of couch grass the exhibit was very free from weeds. The channel was free of weeds.

The last grazing was with 600 sheep (including lambs) for eight days. Mr. Lanyon's usual practice is to put on sheep at the rate of 100 per acre, leave them in for a week, and then spell the lucerne for a month. The soil is permeable, and a monthly watering, using water pumped from Lake Leaghur, is found to be sufficient to keep growth active.

A few shade trees left in the paddock was an attractive and useful feature.

The Awards.

Exhibitor.	Lay Out.	Uniformity.	Condition.	Freedom from Weeds.	Yield.	Total.
Possible	10	10	10	10	10	50
L. Weaver (No. 1)	9½	8	9½	10	7½	44½
V. H. Lanyon (No. 2) ..	9	8½	8	9½	8½	43½
V. H. Lanyon (No. 1) ..	8½	8½	9	9½	7½	43
W. R. Slatter	9	8	9½	9½	6½	42½
L. Weaver	9	8	9	10	6½	
R. H. Webb	8	7½	9	9½	7	41

PASTURE IMPROVEMENT—*Continued from page 154.*

but mention should be made of an introduction "Palestine strawberry clover" which is a big-leafed type with a different rhythm of growth to the ordinary types. It grows freely in winter and spring, when ordinary types are more or less dormant.

Perrennial Red Clover, or Cow Grass, is familiar. It is a short-lived perennial often sown in simple combinations for short leys or included in mixtures to provide early feed while the perennials such as white and strawberry clovers are developing. It will thin out, but lasts usually for three or four years. Red clover has an upright habit of growth—it has large hairy leaves, usually pointed, and with a distinctive white horse-shoe marking.

Red clover—a short-lived perennial.

It is a standard variety for meadow hay, but many farmers regard it with suspicion because of the danger of it bloating cows.

Alsike Clover, which presents characters intermediate between red and white clover, is a distinct species, and is often included in mixtures. It makes good early growth, and is very conspicuous in the second year after sowing. It thins out gradually, but some plants are in evidence for many years.

Lucerne, which is usually grown as a single crop for cutting or grazing, may be a desirable component in any pasture mixture, but under hard grazing its life is limited, and in the higher rainfall areas it can be regarded as a temporary element only.

Its great drought resistant quality enables it to survive in the driest areas of the State, and it is expected to grow in favour in the 14-in. to 20-in. rainfall zones, where, by careful culture, manuring, and regulated grazing, it has given good results maintained over a number of years.

Pasture Mixtures.

The merits of simple mixtures and complex mixtures are often debated. Simple combinations represented by a sward of rye grass and subterranean clover, or white clover and rye grass, are very good, and in the right circumstances a combination of rye grass, cocksfoot, and white clover is near the ideal. An appreciation of this fact with due recognition of the value of superior strains will make for economy in pasture establishment. (There is nothing essentially wrong in more complete mixtures if conditions are good enough, e.g., complex associations can be maintained under irrigation, presenting variety to stock and better continuity of growth.)

The rates of seeding need not be high. If the farmer buys only seed of good germinating capacity he can reduce the rates of sowing, and he should know that the survivors in an established pasture represent only a small proportion of the seedlings which may strike, but conditions at sowing and time of sowing all govern the appropriate rates of seeding.

One influence not generally considered is the suppressive effects of heavy rates of sowing. Perennial rye grass, for example, can be a monopolistic species, and under dry conditions it will establish itself to the exclusion of clover seedlings, cocksfoot, &c., which make desirable associates.

When one considers the length of time pastures will last in a productive condition, it is difficult to understand why some farmers are reluctant to make extended preparations for sowing. The preparation of a clean firm seed bed will ensure a good start even when seasonal conditions are unfavorable, and it is to be recommended, but pastures are often put in under conditions which militate against their successful start and valuable seed is wasted.

Preparatory crops may be grown—represented by winter cereals or summer crops, root

crops, &c., and in the year or two before sowing permanent pastures, thought should be given to grading the ground to eliminate bumps and hollows, which later may present continued obstruction to machines and mowers. Drainage may be improved by proper location of furrows and in some cases contour banking is desirable to avert possible damage from erosion.

The best time of sowing depends on the district. In general, autumn sowing is recommended, and in this connexion autumn does not mean winter. March-April-May covers the most suitable time, and if conditions are propitious a pasture will be well established if it gets a good start before short days and lowered temperatures limit growth. Conditions in June, July, and early August are not conducive to vigorous growth, and if spring establishment is practicable, as it is in the higher rainfall areas, seeding should be deferred until late August and September.

An important factor, and one becoming more serious of late years, is the widespread occurrence of "pea-mites" and the increasing spread of lucerne flea—tiny insects which infest pastures in myriads. They flourish during the cooler times of the year and persecute seedling clovers, which are handicapped. This presents another reason for a clean seed bed—to permit early sowing and a good start for young pastures.

Despite all the emphasis laid on good preparation it is recognized that improvement in the extensive pastoral areas of the State is governed by costs, and pastoralists seek easy means to introduce better species. Surface sowing has been successfully adopted by many who choose conditions and time to permit effective surface tillage and the rapid development of seedlings. In many areas where the rainfall averages 25 inches the following mixture is used:—

Certified Perennial Rye Grass 10 lb. per acre.
Mid. Season Subterranean Clover 2 lb. per acre.

This may be sown under cover of a cereal crop or on stubble ground after a crop of wheat or oats has been harvested, but a more liberal sowing of subterranean clover will help toward a better early development.

With assurance of better rainfall (30 inches and more) cocksfoot and white clover may be included in a mixture for permanent pastures, but these two species require summer rain and are best adapted for the districts where rain is well distributed.

Under such conditions a suitable mixture would be—

Certified Perennial Rye Grass	10 lb. per acre.
Victorian or Certified N.Z. Cocksfoot	5 lb. per acre.
N.Z. White Clover	1 lb. per acre.
Subterranean Clover ..	2 lb. per acre.

Strawberry clover is a desirable element, and a sprinkling of seed, say ¼ lb. per acre in a mixture, permits its satisfactory establishment. Adverting to Italian rye grass, red clover, and alsike clover, it is recommended that they may be added to the above, and a comprehensive mixture may include Italian rye grass (5 lb.) and N.Z. perennial red clover or "cow grass" (2 lb.) and/or alsike clover (1 lb. per acre). These make rapid early development and contribute valuable feed while the more permanent elements are becoming stabilized. There is a danger which should be mentioned; Italian rye grass may grow so tall as to overshadow other elements and it should not be permitted to do so. This applies also to cover crops (cereals sown with the grass mixture). A rapid grazing of young pastures or even an early mowing will be advisable.

There is an idea extant that perennial rye grass should not be allowed to seed in the first year or its character will be changed. This belief probably has its origin in the fact that much of the rye grass previously sold and masquerading under the name "perennial" was an admixture containing the false perennial or annual types, and these, when allowed to grow tall and to flower and seed, prevented most of the perennial plants from growing. They did not persist themselves after the first year, and a very sparse establishment resulted.

Paspalum is chosen by some to replace cocksfoot. It is suggested that it be confined to limited areas—a paspalum dominant pasture is not a good one, but it is admitted that the encouragement of good associate species by top-dressing and proper management of paspalum by hard grazing keeps it in place.

It should be understood that conditions which favour white clover may retard subterranean clover, but the higher the proportion of white clover the better. This is mentioned because some farmers with good swards of white clover are disappointed because subterranean clover does not flourish for them.

Kentucky Blue Grass is a valuable pasture grass not included in the mixture recommended. It comes unbidden in many pastures because it is widely distributed, but it is taboo because it is a "couch" grass which causes trouble when land is put into cultivation.

Timothy, another grass of high merit, is not included. It would grow and persist in our cooler and high rainfall areas, but it is sensitive to dryness and is so palatable to stock that they eat it out.

Meadow Foxtail may be sown by those seeking a grass suitable for wet areas, but it can be regarded as being only of moderate usefulness. It likes moisture, but withstands dryness, and stock are not very fond of it.

Tubercle Free Herds

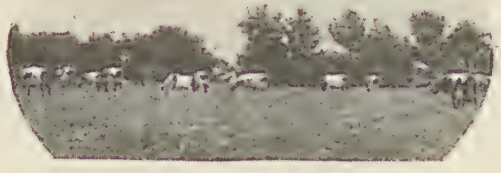
The following herds have been declared free of tuberculosis under the scheme conducted by the Department of Agriculture. Under this scheme a tuberculosis-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests, or, upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

ACCREDITED TUBERCLE FREE HERDS.

Name.	Address.	Number in Herd.	Name.	Address.	Number in Herd.
Ballarat Mental Hosp.	Ballarat	78	Longerenong Agricultural College	Dooen	46
Banyule Stud Pty. Ltd.	Heidelberg	34	Onley, W. H. ..	"Glenholme," Caldermeade	67
Black, Estate, late I. S.	"The Cottage," Mount Noorat	46	Payne, A. E. T. ..	"Yarra View," Lilydale	77
Black, Miss Grace ..	Mount Noorat	35	Payne, T. E. N. ..	"Woodburn," Kilmore	58
Dennis, Mrs. A. A. ..	Frankston	19	Powell, T. S. ..	"Carellen," Mansfield	41
Dookie Agricultural College	Dookie	81	Read, Estate, late John D.	"Springhurst Estate," Springhurst	112
Dunbar and Clark, Messrs.	"Hazeldean Dairy," Mount Dandenong	15	Reid, Ralph G. ..	"Holmwood," Koo-wee-rup	78
Gorman, A. W. ..	"Cathcart," Alexandra	80	Richardson, Bros., Messrs.	"Faldinghurst," Upper Beaconsfield	30
Henderson, J. L. and E. I.	Wangaratta ..	95	Samuel, B. T. ..	Lang Lang	60
Holloway, R. W. ..	Caldermeade ..	56	School of Horticulture	Burnley	6
Kelly, C.	"Glenmore," Creighton's Creek, Euroa	17	State Experiment Farm	Rutherglen ..	51
Lawrence, P. H. ..	"Rainga," Tarrawarra	60	State Research Farm ..	Werribee	211

In addition to the above-mentioned herds there are 104 commercial dairy herds containing 3,317 head of cattle which may be considered free of tuberculosis. All these herds have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds, they cannot be considered as accredited under the accreditation scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

There are also 112 herds in which 5,906 head of cattle have passed one test, and may be considered therefore to be in process of becoming tuberculosis-free herds.



Wheat Varieties in the Mallee

By W. B. MILLER, M.Agr.Sc., Senior Inspector of Agriculture

THE main wheat varieties grown last year in the Mallee were Ghurka (41 per cent. of the area sown) and Ranee 4H (28 per cent.). The other most popular varieties were Bencubbin (8 per cent.), Free Gallipoli (4 per cent.), Dundee (4 per cent.), and Regalia (3 per cent.). In the northern Mallee, Ranee 4H is more popular than Ghurka, but the reverse is the case in the southern Mallee.

The centre of research and experimental work in this District is the Mallee Research Station, Walpeup, but tests are conducted also north of Walpeup (at Werrimull) and in the southern Mallee at Ultima, Woomelang, and Berriwillock. Owing to the drought there was no wheat to harvest last season on the plots at Werrimull and Ultima, but the results at Walpeup and the two other centres are of considerable interest. At Walpeup the best varieties were Bencubbin (13 bushels per acre) and Regalia (12·3). Ranee 4H yielded 10·6 bushels and Ghurka only 8·6 bushels per acre.

The two new varieties Pindar and Quadrat, which are similar in type and maturity to Ghurka, both produced 10 bushels per acre. The season at Walpeup appeared to favour the early varieties, but both Bencubbin and Regalia have yielded well over a long period of years. The average results for four and eight year periods at the Mallee Research Station, in trials sown about the middle of the planting season, are as follow :—

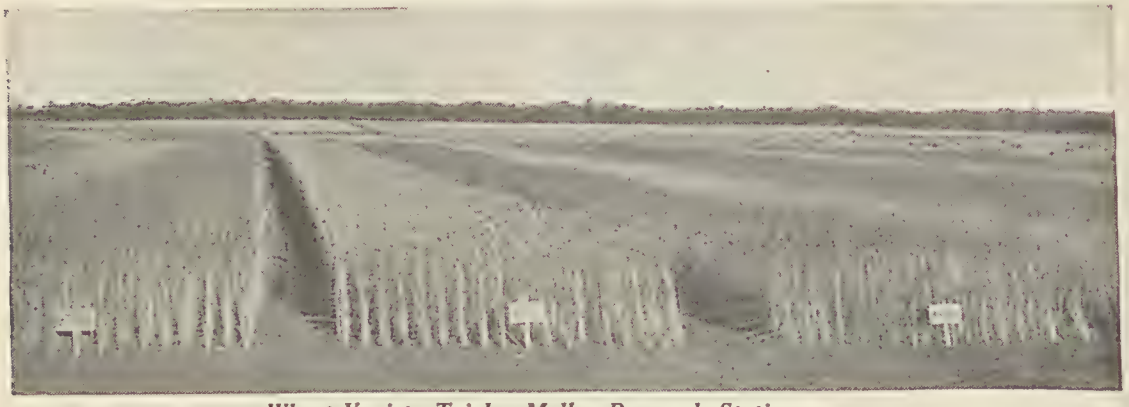
——	Average Four Years.	Average Eight Years.
Bencubbin	27·4	28·4
Baldmin	27·3	*
Quadrat	27·3	..
Regalia	26·9	27·7
Ranee 4H	26·0	27·2
Pindar	26·0	..
Magnet	24·7	..
Dundee	24·2	..
Ghurka	22·2	24·2

* Where the results are not shown the variety has not been tested for the full eight-year period.

It will be seen from the above table that the highest yields have been given by Baldmin and Bencubbin, and it is unfortunate that both these varieties are rather weak in the straw. However,

Typical heads of Regalia. This new variety is proving very popular in the northern Mallee.

many growers have found them sufficiently prolific to offset that shortcoming, provided the areas sown with them are not too great. Quadrat, formerly known as the crossbred Ghurka × C.M.G., has given very satisfactory yields for the four years in which it has been tested and Regalia over the eight year period has yielded more than either Ranee4H or Ghurka. Pindar, which is an improved selection from Ghurka, has outyielded its parent in all the trials in the Mallee, and is confidently recommended to growers in that district who have found Ghurka their best wheat. A distinct advantage of this wheat is the improved bread-making quality of its flour as compared with Ghurka.



Wheat Variety Trials—Mallee Research Station.

It will be noticed, however, that of the varieties tested over the eight-year period, the early maturing types Bencubbin, Regalia, and Ranee 4H have yielded considerably more than Ghurka. This has been the experience at Werrimull also, where for six years Bencubbin and Regalia have both yielded more than a bushel to the acre in excess of Ghurka. It is considered, therefore, that the earlier maturing wheats should be more generally sown in the northern Mallee. In the southern Mallee, however, later maturing types like Ghurka appear to be more prolific than the earlier varieties, and in tests conducted for eight years at Rainbow, Ghurka outyielded Ranee 4H by two bushels per acre and by one bushel per acre over nine years at Swan Hill.

To further compare these varieties with the new wheats in the southern Mallee, experimental plots were sown last year at Ultima by Mr. T. Atkin, at Berriwillock by Mr. W. Cox, and at Woomelang by Mr. A. Barbary. At Ultima the plots failed owing to the drought. At Woomelang light yields were obtained, the leading varieties being Bobin, Bencubbin, Quadrat, and Pindar, all of which yielded between 7 and 8 bushels per acre as compared with Magnet, Ghurka, Dundee, Baldmin, and Ranee 4H, and Regalia which yielded from 6–7 bushels per acre. At Berriwillock, on lighter soil and where more rain was received, only five varieties were sown‘ the average yield per acre being Pindar (20·6 bushels per acre), Quadrat (19·3), Ghurka (18·8), Ranee 4H (16), and Regalia (14·6 bushels per acre).

These results for one year are not conclusive and the incidence of the rainfall certainly was unfavorable to Regalia, but they indicate that the new wheats Pindar and Quadrat have distinct possibilities in the southern Mallee.

Seed of Pindar is now being distributed from the Mallee Research Station, Walpeup, but further tests will be conducted with Quadrat before it is made available to Mallee farmers.

The varieties recommended for the Mallee are:—

—	General Sowing.	Limited Sowing.
Southern Mallee ..	Ghurka ..	Regalia
	Ranee 4H ..	Pindar
		Bencubbin
		Dundee
		Baldmin
Northern Mallee ..	Regalia ..	Pindar
	Ranee 4H ..	Bencubbin
	Ghurka ..	Baldmin

Tapeworms in Poultry

The control of tapeworms in poultry depends mainly on the hygienic conditions under which the birds can be kept. These worms pass an intermediate stage in earthworms and slugs, and the birds become reinfested by eating slugs which have in turn become infested by feeding on contaminated droppings. Therefore, the birds must be prevented from eating the slugs and worms. This is most readily effected by confining the birds in pens on concrete floors, and supplying green food which has not been manured with poultry droppings.

Strict attention to the disposal of droppings and the maintenance of clean conditions in the pens will assist in minimizing trouble.

Victorian F.A.Q. Wheat

Analysis of 1941 Sample

By J. E. O'BRIEN, A.A.C.I., Cereal Chemist

THE results of the analysis and examination of milling and baking qualities of portion of the 1941 official Victorian F.A.Q. wheat sample, together with the results of the preceding seven years, are tabulated below.

Wheat.

The bushel weight, struck at 64¼ lb., is only exceeded by the record weight of 1939.

The appearance of the sample is attractive. The grains are plump and fairly uniform in size, the quantity of broken grain is small and the sample is practically free from foreign seeds.

TABLE I.—ANALYTICAL RESULTS.—WHEAT.

—	1934.	1935.	1936.	1937.	1938.	1939.	1940.	1941.
Moisture (per cent.)	10·9	11·8	12·2	12·7	11·8	9·1	10·7	11·0
Impurities (screenings) (per cent.) ..	4·8	8·6	4·9	4·5	5·3	3·4	4·1	3·8
Ash (per cent.)	1·36	1·61	1·41	1·34	1·30	1·26	1·43	1·20
Protein (N x 5·7) (per cent.) ..	9·53	10·93	9·74	9·80	11·09	12·81	9·78	11·74
Bushel weight (lb.)	60	60	63½	62	63½	64½	63½	64¼
Pelshenke figure (mins.)	24	24	26	24	28	36	26	39

Analytical results on the wheat are given in Table I. The impurities consisted mainly of broken grain with a few clumps of unthreshed grain and a little straw. Due to the dry year the protein—and consequently the gluten content—is higher than usual and this, together with the quality of the gluten, is reflected in the relatively high Pelshenke figure (wheat-meal fermentation test).

Flour.

The cleaned wheat, conditioned to 14·5 per cent. moisture, milled easily on the experimental mill to give a good, clean, bright flour.

TABLE II.—ANALYTICAL RESULTS—FLOUR.

—	1934.	1935.	1936.	1937.	1938.	1939.	1940.	1941.
Moisture (per cent.)	..	..	..	..	11·6	11·1	12·6	12·4
Yield (per cent.)	72·8	71·7	73·6	71·3	73·8	71·3	72·9	73·2
Ash (per cent.)	0·51	0·56	0·48	0·50	0·48	0·54	0·48	0·47
Protein (N x 5·7) (per cent.) ..	8·79	9·39	9·00	9·12	9·92	11·17	8·78	10·43
Wet gluten (per cent.)	23·1	26·8	27·4	26·4	30·4	38·7	28·8	30·8
Dry gluten (per cent.)	7·9	9·1	9·1	8·4	9·9	12·2	9·5	10·4
Water absorption—								
Hand (per cent.)	50·6	50·6	50·0	50·2	50·6	50·0	50·2	52·5
Farinograph (per cent.)	..	..	..	..	54·5	63·0	57·4	61·8
Maltose figure	195	84	159	142	152	168	155	152
Valorimeter No. (farinograph) ..	..	..	..	..	34	46	42	44

The gluten is firm and elastic, of good quality and better than average quantity, showing considerable improvement over the preceding year. The diastatic activity is low but typical of Victorian wheat. This, however, is not a serious disadvantage, as it may be easily overcome by correct blending during milling, or the addition of malt flour or malt extract during baking.

The dough, when tested on the Brabender Farinograph, gives a curve which shows good stability and elasticity, and a longer mixing period than that of 1940, and which is generally well balanced. The curve suggests the presence of a higher percentage of a variety such as Baldwin or Dundee in the F.A.Q. sample than is usual, although the drought conditions under which the wheat was grown exercised a powerful influence on quality.

The results of the standard baking tests are given in Table III.

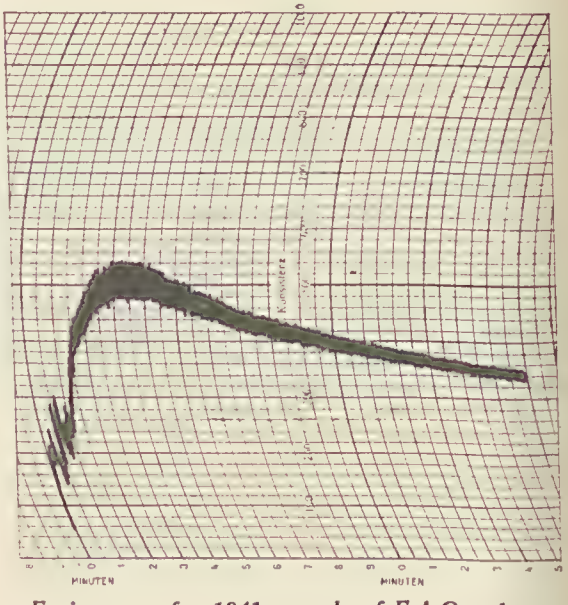
TABLE III.—BAKING TESTS (100 GRM. FLOUR).

Procedure.	Loaf Volume in c.c.				
	1937.	1938.	1939.	1940.	1941.
Basic	395	450	397	392	442
Basic + malt + phosphate	440	510	475	460	517
Basic + malt + phosphate + bromate ..	385	490	517	497	561

The baking test was very satisfactory; all the loaves being bold, of pleasing crust colour, and possessing good even texture.

The flour shows good response to malt-phosphate, indicating that improvement can be effected by increasing the diastatic activity and also by adding yeast foods.

The substantial volume increase due to the addition of bromate indicates that the flour will improve with age, and that it will respond to flour improvers. All the loaves were mature,



Farinogram for 1941 sample of F.A.Q. wheat.

and the colour and texture of the crumb was very satisfactory. A further test was made using a commercial formula which included a flour improver. Portions of the dough, which were scaled off at half-hourly intervals and proofed to constant height, gave loaves which showed no significant difference in volume or appearance. It may be concluded that this season's flour will stand considerable work, has good fermentation tolerance, and will prove very satisfactory to the baker.

The yield of bran and pollard was normal, and the protein content of each higher than that of last year.

The results of this year's F.A.Q. wheat are very gratifying from a quality aspect, but while this is due in part to an increase in the proportion of better quality wheats now being grown, it is largely the result of the abnormal season, which improved quality at the sacrifice of yield.

Butterfat Tables

The Department of Agriculture has published a booklet of butterfat tables based on percentages of fat contained in milk tested by the Babcock method. This useful ready reckoner should be invaluable to herd testers and to farmers who are doing their own milk testing. The range of the tables includes all milk weights from 1 to 1,000 lb., while butterfat results are worked out for tests from 2·7 to 9 per cent. Very little study is required to become efficient in the use of the ready reckoner, which will relieve the tester and dairy farmer of a considerable amount of calculating and, at the same time assist in obtaining a high degree of accuracy in tabulating herd records. The ready reckoner may be obtained from the Director, Department of Agriculture, Melbourne, C.2, for the sum of sixpence (including postage).

Burnley Egg-Laying Competition

Results for 1940-41

By H. F. CLINTON, Poultry Expert.

THE thirtieth Egg-laying Competition for fowls, conducted at the Burnley School of Primary Agriculture and Horticulture, commenced on 1st April, 1940, and concluded on 2nd March, 1941, a period of 48 weeks.

The competition continues to be well supported by breeders and some well-known competitors were again prize winners, while several very high scores were recorded.

The weather conditions generally throughout the test were favorable for egg production, and taking everything into consideration the competition was a most successful one.

Egg-Laying Competitions.

The competitions probably have done more to draw attention to the potentialities of commercial egg production than any other single factor, and have become a recognized and essential part in the building up of the poultry industry in most parts of the world.

The results obtained in such competitions have a definite influence in assisting to establish stock of the most desirable quality on commercial poultry farms, and, therefore, render a very distinct service to the industry.

At the present time competitions are being conducted in all the States of the Commonwealth.

The Burnley Competition commenced in the year 1911, and the highest number of first grade eggs obtained from a team of six birds was laid by the late Mr. J. J. Herbert's team of six Australorps during twelve months ended the 31st March, 1940, the total being 1,788 first grade eggs.

In the competition just concluded Mr. Herbert entered another team of six Australorps, which has put up another remarkable performance by laying 1,702 first grade eggs up to the 2nd March (48 weeks), 37 first grade eggs more than his team of Australorps laid up to the end of the same period last year. This performance has qualified the team to be retained until the 31st March, 1941, to ascertain if the previous record for twelve months can be beaten. This is the third competition in succession that birds entered by the late Mr. Herbert have won in this class at the conclusion of the competitions for 48 weeks.

Mr. J. R. Maddison's White Leghorn which gained first place in the dry mash section for this breed with a score of 279 first-grade eggs.

Mr. F. W. Becker's team of six White Leghorns in the Wet Mash Section also has qualified to be retained for the full twelve months, the birds having laid 1,637 first grade eggs up to the 2nd March. This is another outstanding performance. Last year Mr. Becker's team in this class was retained for twelve months and exceeded the previous Burnley record for a team of White Leghorns by laying 1,719 first grade eggs. This is the third competition in succession that Mr. Becker has won in this class at the conclusion of the competitions for 48 weeks.

The highest number of eggs laid by a single bird for twelve months since the commencement of the Burnley Competition was that recorded in 1923–24 by a Black Orpington (now Australorp)

owned by Mr. W. Cullen. This bird laid 338 eggs (last egg weighed $2\frac{7}{16}$ oz.).

In the competition just concluded, another remarkable performance was put up by Mr. F. W. Becker's Australorp in Section B. This bird laid 312 first grade eggs in the 48 weeks up to the 2nd March, and, therefore, qualified to be retained for another month in order to see if the previous twelve months' record (338) for a single bird of any breed can be beaten. With regard to the above-mentioned birds entered by Mr. F. W. Becker and the late J. J. Herbert, their performances for the full twelve months ended 31st March, 1941, will be published in a subsequent issue of this Journal.

Approximately 250 visitors attended the poultry farmers' field day at the Burnley Gardens on Saturday afternoon, 1st February, 1941, when the competition birds in the 1940-41 competition were inspected. Short talks were given by officers of the Department of Agriculture and an exhibit of poultry appliances, records, foods, and eggs was displayed in the pavilion. The day proved to be a most successful and enjoyable one, largely due to the assistance rendered by the National Utility Poultry Breeders Association (Victorian Branch), representatives of poultry organizations, visitors from country districts, and the great number of competitors and supporters of the Burnley Competition.

Keen interest continues to be taken in Rhode Island Reds, and 96 birds of that breed competed in the competition just concluded.

TABLE SHOWING MONTHLY LAYING RETURNS.

SECTION A.

Month.	Light Breeds.			Heavy Breeds.					
	White Leghorns.			Australorps.			Other Heavy Breeds. (Rhode Island Reds.)		
	Average No. of Birds.	Total.	Average.	Average No. of Birds.	Total.	Average.	Average No. of Birds.	Total.	Average.
April	222	2,539	11·4	126	1,562	12·4	66	621	9·4
May	219	2,448	11·2	126	1,902	15·1	66	729	11·0
June	218	2,457	11·3	125	2,062	16·5	66	849	12·9
July	216	3,437	15·9	124	2,402	19·4	65	1,078	16·6
August	214	4,450	20·8	123	2,710	22·0	65	1,230	18·9
September	213	4,826	22·7	123	2,721	22·1	65	1,354	20·8
October	213	4,987	23·4	122	2,353	19·3	64	1,279	20·0
November	212	4,569	21·6	121	2,392	19·8	64	1,132	17·7
December	210	4,318	20·6	120	2,149	17·9	64	1,031	16·1
January	208	3,971	19·1	119	2,085	17·5	64	1,009	15·8
February	208	3,549	17·1	118	1,885	16·0	64	878	13·7

SECTION B.

Month.	Light Breeds.						Heavy Breeds.					
	White Leghorns.			Other Light Breeds.			Australorps.			Other Heavy Breeds.		
	Average No. of Birds.	Total.	Average.	Average No. of Birds.	Total.	Average.	Average No. of Birds.	Total.	Average.	Average No. of Birds.	Total.	Average.
April	108	1,657	15·3	6	58	9·7	64	931	14·5	38	404	10·6
May	108	1,816	16·8	6	94	15·7	64	1,105	17·3	37	500	13·5
June	108	1,711	15·8	6	51	8·5	64	1,108	17·3	37	482	13·0
July	108	1,860	17·2	5	53	10·6	64	1,232	19·3	35	529	15·1
August	108	2,137	19·8	5	91	18·2	64	1,325	20·7	34	628	18·5
September ..	107	2,384	22·3	5	104	20·8	63	1,324	21·0	34	615	18·1
October	107	2,375	22·2	5	98	19·6	63	1,241	19·7	34	634	18·6
November ..	107	2,319	21·7	5	90	18·0	63	1,059	16·8	34	511	15·0
December ..	107	2,270	21·2	5	89	17·8	62	967	15·6	33	466	14·1
January	106	2,138	20·2	5	68	13·6	62	941	15·2	32	445	13·9
February ..	106	1,950	18·4	5	57	11·4	62	836	13·5	32	427	13·3

Mortality among the competing birds was 5·8 per cent. As it is in the interest of all poultry breeders to improve their flocks and reduce mortality, competitors should exercise special care in the selection of the stock used to produce birds for egg-laying competitions, and breed only from those possessing a high degree of constitutional vigour.

The average number of eggs produced by the fowls compared with averages taken over the previous five years continues to be highly satisfactory, as may be seen from the following table :—

AVERAGE NUMBER OF EGGS LAID PER BIRD.

Competition (48 Weeks).	First Grade.	Underweight.	Total.
1935–36	176.8	7.8	184.6
1936–37	183.7	4.4	188.1
1937–38	190.3	2.9	193.2
1938–39	190.2	4.9	195.1
1939–40	188.0	3.9	191.9
1940–41	185.7	8.4	194.1

In the competition prize certificates and sashes were awarded for the greatest number of first-grade eggs laid. During the first two months of the competition a first-grade egg must weigh not less than $1\frac{3}{4}$ oz., and thereafter not less than 2 oz.

At Burnley every egg is weighed to one-tenth of an ounce. These records are available for examination by any competitor.

During the currency of the present competition, the poultry industry suffered a severe loss by the death of three well-known Burnley competitors, namely, Messrs. S. N. Lloyd, Frankston, J. J. Herbert, Wonthaggi, and Miss E. J. Shapland, Braeside.

The following table, which sets out the percentages of first grade eggs, underweight eggs, mortality, &c., during the past sixteen years is of interest also :—

SHOWING THE IMPROVEMENT IN PERCENTAGE OF FIRST-GRADE EGGS, 1925–26 TO 1940–41.

Year.	Percentage of First-grade Eggs.	Percentage of Underweight Eggs.	Average Number of Eggs per Bird.	Percentage Mortality.
	%	%	%	%
1925–26* ..	79.8	20.2	206.3	5.4
1926–27 ..	86.0	14.0	202.3	3.9
1927–28 ..	88.4	11.6	197.8	4.2
1928–29 ..	90.8	9.2	199.0	6.7
1929–30 ..	89.9	10.1	187.3	4.3
1930–31 ..	90.3	9.7	193.3	6.4
1931–32 ..	92.6	7.4	195.2	5.1
1932–33 ..	93.6	6.4	189.9	5.5
1933–34 ..	93.5	6.5	185.1	7.7
1934–35 ..	94.7	5.3	186.4	6.4
1935–36 ..	95.8	4.2	184.6	8.9
1936–37 ..	97.6	2.4	188.1	6.1
1937–38 ..	98.5	1.5	193.2	6.6
1938–39 ..	97.5	2.5	195.1	8.9
1939–40 ..	98.0	2.0	191.9	7.6
1940–41 ..	95.7	4.3	194.1	5.8

* The 1925–26 competition was conducted over a period of 52 weeks, all other competitions 48 weeks.

This team of White Leghorns owned by Mr. F. W. Becker won the wet mash section for this breed with a total of 1637 first-grade eggs.

Mr. F. W. Becker's winning team of White Leghorns in the dry mash section. These birds laid 1581 first-grade eggs.

The Awards.

Teams of Six.

In Section A, Class 1, White Leghorns, Wet Mash, Mr. F. W. Becker, who won first prize in this class in the two previous competitions, was again successful, and he also gained a second prize—Burnley Sash—with a team that laid 1,637 first-grade eggs, the second highest score recorded in Section A. As mentioned previously, these birds were retained for the full twelve

STATEMENT SHOWING THE NUMBER OF EGGS LAID BY THE VARIOUS BREEDS IN THE COMPETITION, AND THE AVERAGE NUMBER OF EGGS LAID PER BIRD.

Breeds.	Number of Birds After Allowing for Deaths.	Eggs Laid.			Average Number of Eggs Laid per Bird.		
		First Grade.	Under-weight.	Total.	First Grade.	Under-weight.	Total.
Light Breeds—Wet Mash—							
White Leghorns	241	46,591	1,850	48,441	193·3	7·7	201·0
Anconas	1	178	..	178	178·0	..	178·0
Brown Leghorns	4	667	9	676	166·8	2·2	169·0
Total Light Breeds—Wet Mash	246	47,436	1,859	49,295	192·8	7·6	200·4
Light Breeds—Dry Mash—							
White Leghorns	80	15,393	471	15,864	192·4	5·9	198·3
Total Light Breeds—Wet and Dry Mash	326	62,829	2,330	65,159	192·7	7·2	199·9
Heavy Breeds—Wet Mash—							
Australorp	186	34,087	2,452	36,539	183·3	13·2	196·5
Rhode Island Reds	91	15,388	323	15,711	169·1	3·5	172·6
White Wyandottes	2	379	..	379	189·5	..	189·5
Light Sussex	6	779	36	815	129·8	6·0	135·8
Total Heavy Breeds—Wet Mash	285	50,633	2,811	53,444	177·6	9·9	187·5
Total All Breeds—Wet and Dry Mash	611	113,462	5,141	118,603	185·7	8·4	194·1

months, and further particulars will be published in a subsequent issue of this Journal.

White Wings Poultry Farm (C. Gowers), equal second prize winner last year, was again awarded second prize with a team that laid 1,322 eggs, while Mr. E. J. Marchant's team was third with 1,249 eggs. A bird in Mr. Becker's winning team in this class laid 290 first-grade eggs.

In Class 2, White Leghorns, Dry Mash, first prize and a third prize Burnley Sash went to Mr. F. W. Becker with a team that laid 1,581 first-grade eggs. Mr. Becker obtained first prize in this class in the previous competition. Mr. C. R. Fagg, who won in this class in the 1938–39 competition, and also gained second prize last year, again obtained second prize with 1,212 eggs.

A bird in Mr. Becker's winning team in this class laid 287 first-grade eggs.

In Class 4, Australorps, the late Mr. J. J. Herbert won first prize and a Burnley Champion Sash with a team that laid a total of 1,702 first-grade eggs, the highest score in all classes of Section A. These birds also were retained for the full twelve months to ascertain if they can exceed the previous Burnley record in the number of eggs laid. Mr. W. J. Weston was awarded second prize with a team that laid a very good score of 1,517 eggs, and Mr. J. F. McLean secured third prize with 1,274 eggs. A bird in Mr. Herbert's winning team in this class laid 309 first-grade eggs, the highest score recorded by an individual bird in all classes of Section A.

In Class 5, Rhode Island Reds, Mr. A. J. Glanfield was awarded first prize for a team that laid a good score of 1,250 first-grade eggs.

A White Leghorn owned by Mr. A. R. Davey. This bird gained first place in the wet mash section with a total of 271 first-grade eggs.

Messrs. Tedstone and Rankin won second prize with a team that laid 1,175 eggs, and Mr. J Chatts was awarded third prize with 1,110 eggs. Individual birds in this class belonging to Messrs. Tedstone and Rankin, and Mr. A. E. Hill, each laid 242 first-grade eggs.

Individual Birds.

In Section B, Class 1, White Leghorns, Wet Mash, first prize was won by Mr. A. R. Davey with a bird that laid 271 first-grade eggs.

A Rhode Island Red team owned by Mr. A. J. Glanfield, which laid 1250-first grade eggs.

Mr. T. J. Stevens followed closely for second prize with a total of 266 eggs, only five eggs behind the first prize bird, while Messrs. Squirrell Bros. was a close third with 263 eggs.

In Class 2, White Leghorns, Dry Mash, first prize was won by Mr. J. R. Maddison with a bird that laid 279 first-grade eggs. Mr. T. A. Pettigrove followed closely for a second prize with a total of 269 eggs, while Mr. E. J. Patten was third with 268 eggs, only one egg behind the second prize bird.

In Class 3, All Light Breeds, other than White Leghorns, Wet Mash, Mr. J. Granter was awarded first prize with a Brown Leghorn that laid 231 first-grade eggs.

In Class 4, Australorps, first prize and a Burnley Champion Sash went to Mr. F. W. Becker with a bird that returned a particularly good total of 312 first-grade eggs, the highest score recorded for an individual bird in all classes of Sections A and B. This bird also was retained for twelve months. Second prize and a second prize Burnley Sash was awarded to the late Mr. J. J. Herbert with a bird that laid 295 eggs, the second highest score recorded in Section B. Mr. F. W. Becker also secured third prize, and a third prize Burnley Sash with 294 eggs, only one egg behind the second prize bird.

In Class 5, Rhode Island Reds, Mr. A. Johnson won first prize with a bird that laid 245 first-grade eggs. Mr. J. Chatts, who is a very consistent prize-winner, secured second prize with 244 eggs, only one behind the winning bird, while Mr. N. D. Underwood followed closely for third prize with 241 eggs.

Greatest Weight of Eggs.

For individual birds, in both Sections A and B, that laid the greatest weight of eggs, the late Mr. J. J. Herbert won first prize with an Australorp that laid 309 eggs, weighing 676.2 oz. (42 lb. 4.2 oz.). The second prize was awarded to the same breeder for an Australorp that laid 293 eggs, weighing 655.9 oz. (40 lb. 15.9 oz.). Mr. F. W. Becker was third with an Australorp that laid 318 eggs, weighing 650.6 oz. (40 lb. 10.6 oz.). The number of eggs shown above was the total number laid by each of these birds.

Cost of Feeding, &c.

There were 630 fowls in the competition at its commencement, but 37 of these died. The total number of days these latter birds collectively were in the pens was 6,148, which is equal to approximately 18 birds having been there for the full 48 weeks. Therefore, the total number of birds in the competition for the whole period may be regarded as 611, and this is the figure used in working out averages, &c.

Mr. A. Johnson's winning Rhode Island Red which laid 245 first-grade eggs.

The different kinds and quantities of the food fed to the birds during the currency of the competition were as follow:—Wheat, 20,406 lb.; hulled oats, 5,629 lb.; cracked maize, 5,100 lb.; bran, 12,875 lb.; pollard, 22,615 lb.; meat-meal, 228 lb.; dried whey, 224 lb.; meat, 3,399 lb.; onions, 301 lb.; grit, 2,788 lb.; salt, 198 lb.; charcoal, 198 lb.

The total number of eggs laid, including those under weight, was 118,603, an average per bird of 194·1 for the 48 weeks.

The price realized for the eggs averaged 1s. 3¼d. per dozen. The market value of the eggs averaged £1 0s. 6½d. per bird, and the cost of food averaged 8s. 4½d. per bird, a fraction over 2¼d. per week; thus the profit over cost of food for 48 weeks averaged 12s. 2d. per bird. The prices received for the eggs, however, are the net prices, exclusive of freight or commission charges, &c. Also, it must be remembered that the eggs were laid by pullets in their first period of production, which were kept in single pens or in teams of six, the conditions being entirely different from those on commercial farms where birds of various ages are kept in large flocks.

Prize List—1940-41

SECTION A.—TEAMS OF SIX BIRDS—TRAP-NESTED.

Pen No.	Name and Address.	Total Eggs.	Under-weight.	First Grade Eggs.
	Class 1.—White Leghorns—Wet Mash.			
	1st Prize—Champion Certificate, also Second Prize—Burnley Sash.			
6	F. W. Becker, Follett-road, Cheltenham, S.22	1,637	..	1,637
	Second Prize—Government Certificate.			
1	White Wings Poultry Farm (C. Gowers), 97 Church-road, Carrum	1,322	..	1,322
	Third Prize—Government Certificate.			
17	E. J. Marchant, 56 White-street, Mordialloc, S. 12	1,309	60	1,249
	Class 2.—White Leghorns—Dry Mash.			
	First Prize—Champion Certificate, also Third Prize—Burnley Sash.			
30	F. W. Becker, Follett-road, Cheltenham, S.22	1,583	2	1,581
	Second Prize—Government Certificate.			
32	C. R. Fagg, 76 Maud-street, Geelong	1,224	12	1,212
	Class 4.—Australorps—Wet Mash.			
	First Prize—Champion Certificate, also Burnley Champion Sash.			
55	J. J. Herbert (deceased), 13 Dunn-street, Wonthaggi	1,705	3	1,702
	Second Prize—Government Certificate.			
59	W. Weston, 104 Broome-crescent, Wonthaggi	1,562	45	1,517
	Third Prize—Government Certificate.			
58	J. F. McLean, Follett-road, Cheltenham, S.22	1,288	14	1,274
	Class 5.—Rhode Island Reds—Wet Mash.			
	First Prize—Champion Certificate.			
41	A. J. Glanfield, 132 Separation-street, Northcote, N.16	1,279	29	1,250
	Second Prize—Government Certificate.			
49	Tedstone and Rankin, 243 Whitehorse-road, Balwyn, E.8	1,177	2	1,175
	Third Prize—Government Certificate.			
40	J. Chatts, White-street, Beaumaris, S.10	1,182	72	1,110

Mr. J. Granter's Brown Leghorn which laid 231 first-grade eggs.

SECTION B.—INDIVIDUAL BIRDS, SINGLE TEST.

Pen No.	Name and Address.	Total Eggs.	Under-weight.	First Grade Eggs.
	Class 1.—White Leghorns—Wet Mash.			
	First Prize—Champion Certificate.			
86	A. R. Davey, Edward-street, Greensborough	274	3	271
	Second Prize—Government Certificate.			
81	T. J. Stevens, 309 Darling-street, Ballarat	268	2	266
	Third Prize—Government Certificate.			
57	Squirrell Bros., Tulip-street, Cheltenham, S.22	286	23	263
	Class 2.—White Leghorns—Dry Mash.			
	First Prize—Champion Certificate.			
216	J. R. Maddison, Redcliffs P.O.	279	..	279
	Second Prize—Government Certificate.			
218	T. A. Pettigrove, 159 Hawdon-street, Heidelberg, N.22	270	1	269
	Third Prize—Government Certificate.			
210	E. J. Patten, 35 Monash-street, Preston, N.19	271	3	268

PRIZE LIST—*continued.*

Section B.—Individual Birds, Single Test—*continued.*

Pen No.	Name and Address.	Total Eggs.	Under-weight.	First Grade Eggs.
Class 3.—All Light Breeds other than White Leghorns—Wet Mash.				
FIRST PRIZE—CHAMPION CERTIFICATE.				
190	J. Granter, 163 Martin-street, Gardenvale, S.4 (Brown Leghorn)	233	2	231
Class 4.—Australorps—Wet Mash.				
FIRST PRIZE—CHAMPION CERTIFICATE, ALSO BURNLEY CHAMPION SASH.				
102	F. W. Becker, Follett-road, Cheltenham, S.22	318	6	312
SECOND PRIZE—GOVERNMENT CERTIFICATE; ALSO SECOND PRIZE—BURNLEY SASH.				
115	J. J. Herbert (deceased), 13 Dunn-street, Wonthaggi	295	..	295
THIRD PRIZE—GOVERNMENT CERTIFICATE; ALSO THIRD PRIZE—BURNLEY SASH.				
101	F. W. Becker, Follett-road, Cheltenham, S.22	294	..	294
Class 5.—Rhode Island Reds—Wet Mash.				
FIRST PRIZE—CHAMPION CERTIFICATE.				
166	A. Johnson, Sunray-avenue, Cheltenham, S.22	245	..	245
SECOND PRIZE—GOVERNMENT CERTIFICATE.				
179	J. Chatts, White-street, Beaumaris, S.10	244	..	244
THIRD PRIZE—GOVERNMENT CERTIFICATE.				
173	N. D. Underwood, Arbour-street, Alphington, N.20	249	8	241

SECTION A.—FOR THE GREATEST NUMBER OF FIRST GRADE EGGS LAID BY INDIVIDUAL BIRDS IN EACH CLASS OF SECTION A.

Pen No.	Name and Address.	Bird No.	Total Eggs.	Under-weight.	First Grade Eggs.
Class 1.—White Leghorns—Wet Mash.					
FIRST PRIZE—CHAMPION CERTIFICATE.					
6	F. W. Becker, Follett-road, Cheltenham, S.22	33	290	..	290
SECOND PRIZE—GOVERNMENT CERTIFICATE.					
6	F. W. Becker, Follett-road, Cheltenham, S.22	32	289	..	289
THIRD PRIZE—GOVERNMENT CERTIFICATE.					
17	E. J. Marchant, 56 White-street, Mordialloc, S.12	99	274	5	269
Class 2.—White Leghorns—Dry Mash.					
FIRST PRIZE—CHAMPION CERTIFICATE.					
30	F. W. Becker, Follett-road, Cheltenham, S.22	175	287	..	287

Section A.—*continued.*

Pen No.	Name and Address.	Total Eggs.	Under-weight.	First Grade Eggs.
Class 2.—White Leghorns—Dry Mash—*continued.*				
SECOND PRIZE—GOVERNMENT CERTIFICATE.				
30	F. W. Becker, Follett-road, Cheltenham, S.22	179	279	..	279
THIRD PRIZE—GOVERNMENT CERTIFICATE.				
30	F. W. Becker, Follett-road, Cheltenham, S.22	177	277	..	277
Class 4.—Australorps—Wet Mash.				
FIRST PRIZE—CHAMPION CERTIFICATE.				
55	J. J. Herbert (deceased), 13 Dunn-street, Wonthaggi	329	309	..	309
SECOND PRIZE—GOVERNMENT CERTIFICATE.				
55	J. J. Herbert (deceased), 13 Dunn-street, Wonthaggi	327	304	1	303
THIRD PRIZE—GOVERNMENT CERTIFICATE.				
55	J. J. Herbert (deceased), 13 Dunn-street, Wonthaggi	330	293	..	293
Class 5.—Rhode Island Reds—Wet Mash.				
EQUAL FIRST PRIZE—CHAMPION CERTIFICATE.				
49	Tedstone and Rankin, 243 Whitehorse-road, Balwyn, E.8	292	243	1	242
EQUAL FIRST PRIZE—CHAMPION CERTIFICATE.				
44	A. E. Hill, 26 Brenbeal-street, Balwyn, E.8.	262	242	..	242
THIRD PRIZE—GOVERNMENT CERTIFICATE.				
41	A. J. Glanfield, 132 Separation - street, Northcote, N.16	244	241	..	241

SECTION A.—FIRST CLASS CERTIFICATES OF MERIT TO TEAMS IN CLASSES 1, 2, AND 4, WHICH LAID 1,200 FIRST GRADE EGGS, AND IN CLASS 5, WHICH LAID 1,000 FIRST GRADE EGGS.

Pen No.	Name and Address.	First Grade Eggs.
Class 1.—White Leghorns—Wet Mash.		
20	T. A. Pettigrove, 159 Hawdon-street, Heidelberg, N.22	1,247
3	K. McKenzie, Whittington P.O., St. Albans, via Geelong	1,241
27	Wimbledon Poultry Farm (J. Mooney), 360 Pascoevale-road, Pascoevale, W.8	1,229
14	C. and D. McLauchlan, 144 Through-road, Burwood, E.13	1,228
4	"Aristoc Poultry Farm" (F. Walker, 206 Bay-road, Sandringham, S.8	1,213

PRIZE LIST—*continued.*

Section A.—*continued.*

Pen No.	Name and Address.	First Grade Eggs.
	Class 4.—Australorps—Wet Mash.	
60	Mrs. D. Mason, Mt. Evelyn-road, Lilydale	1,236
	Class 5.—Rhode Island Reds—Wet Mash.	
39	Tedstone and Rankin, 243 Whitehorse-road, Balwyn, E.8	1,096
45	S. N. Lloyd (deceased), Box 21, Frankston	1,071

FIRST CLASS CERTIFICATES OF MERIT TO INDIVIDUAL BIRDS IN CLASSES 1, 2, AND 4, WHICH LAID 220 FIRST GRADE EGGS, AND IN CLASS 5, WHICH LAID 200 FIRST GRADE EGGS.

Pen No.	Name and Address.	Bird No.	First Grade Eggs.
	Class 1.—White Leghorns—Wet Mash.		
6	F. W. Becker, Follett-road, Cheltenham, S.22	31	267
	,, ,, ,, ,,	34	262
	,, ,, ,, ,,	35	263
	,, ,, ,, ,,	36	266
1	White Wings Poultry Farm (C. Gowers), 99 Church-road, Carrum	1	238
	,, ,, ,, ,,	3	233
	,, ,, ,, ,,	5	228
	,, ,, ,, ,,	6	244
17	E. J. Marchant, 56 White-street, Mordialloc, S. 12	98	240
20	T. A. Pettigrove, 159 Hawdon-street, Heidelberg, N.22	115	238
	,, ,, ,, ,,	116	226
3	K. McKenzie, Whittington P.O., St. Albans, via Geelong	13	228
	,, ,, ,, ,,	18	227
27	Wimbledon Poultry Farm (J. Mooney), 360 Pascoevale-road, Pascoevale, W.8	161	240
	,, ,, ,, ,,	162	220
14	C. and D. McLauchlan, 144 Through-road, Burwood, E.13	79	238
	,, ,, ,, ,,	84	229
4	"Aristoc Poultry Farm" (F. Walker), 206 Bay-road, Sandringham, S.8	20	220
26	T. A. Welch, corner of Bayswater-road and Central-avenue, Bayswater	153	233
24	J. A. Stewart, Maldon-road, Castlemaine	139	254
	,, ,, ,, ,,	142	250
25	G. Walker, 206 Bay-road, Sandringham, S.8	146	233
	,, ,, ,, ,,	148	242
	,, ,, ,, ,,	149	230
16	L. Magnusson, Private Bag, Nathalia	95	222
22	Sorrento Farm, Campbell-road, Sorrento	127	265
	,, ,, ,, ,,	128	237
28	T. J. Crewther, Carlow-street, East Bentleigh, S.E. 15	166	229
	,, ,, ,, ,,	167	239
10	J. W. Hattwell, 44 Ebden-street, Elsternwick, S.4	60	251

First Class Certificates of Merit—*continued.*

Pen No.	Name and Address.	Bird No.	First Grade Eggs.
	Class 1.—White Leghorns—Wet Mash—*continued.*		
19	Molson's White Leghorn Stud, 188 Surrey-road, Blackburn	111	232
	,, ,, ,, ,,	114	220
8	J. T. Fraser, 19 Collins-street, Bentleigh, S.E.14	45	221
7	B. G. Evans, Block 21A, Redcliffs ..	40	255
	Class 2.—White Leghorns—Dry Mash.		
30	F. W. Becker, Follett road, Cheltenham, S.22	178	254
	,, ,, ,, ,,	180	268
32	C. R. Fagg, 76 Maud-street, Geelong	187	226
	,, ,, ,, ,,	189	231
31	,, ,, ,, ,,	184	221
29	J. M. Sutherland, Fulton-road, Box Hill	174	233
	Class 4.—Australorps—Wet Mash.		
55	J. J. Herbert (deceased), 13 Dunn-street, Wonthaggi	325	289
	,, ,, ,, ,,	326	237
	,, ,, ,, ,,	328	271
59	W. Weston, 104 Broome-crescent, Wonthaggi	349	256
	,, ,, ,, ,,	350	261
	,, ,, ,, ,,	352	276
	,, ,, ,, ,,	353	253
	,, ,, ,, ,,	354	256
58	J. F. McLean, Follett road, Cheltenham, S. 22	345	233
	,, ,, ,, ,,	347	245
	,, ,, ,, ,,	348	220
60	Mrs. D. Mason, Mount Evelyn road, Lilydale	355	231
	,, ,, ,, ,,	357	220
	,, ,, ,, ,,	359	221
	,, ,, ,, ,,	360	229
50	C. H. Harvey, Pakenham South ..	295	250
	,, ,, ,, ,,	300	264
65	D. and J. Tresise, Serpentine ..	387	237
	,, ,, ,, ,,	388	225
53	F. W. Greenfield, Goodwin-street, Blackburn	314	257
67	Wimbledon Poultry Farm (J. Mooney), 360 Pascoevale-road, Pascoevale, W.8	398	234
	,, ,, ,, ,,	401	221
68	R. S. Youl, "Wycherley," Wedderburn	406	232
	,, ,, ,, ,,	408	255
52	J. T. Cornish, Healesville ..	312	223
57	C. and D. McLauchlan, 144 Through-road, Burwood, E.13	337	237
51	Avonlea Stud Poultry Farm (J. Aitken), Silver-street, Cheltenham, S.22	305	235
62	W. A. Shevill, 35 Bourke-street, Mentone S.11	372	237
69	T. J. Crewther, Carlow-street, East Bentleigh, S.E.15	411	253
56	S. N. Lloyd (deceased), Box 21, Frankston	336	223

Prize List—*continued.*

First Class Certificates of Merit—*continued.*

Pen No.	Name and Address.	Bird No.	First Grade Eggs.
	Class 5.—Rhode Island Reds—Wet Mash.		
41	A. J. Glanfield, 132 Separation-street, Northcote, N.16	241	230
	,, ,, ,, ,,	242	213
	,, ,, ,, ,,	243	205
49	Tedstone and Rankin, 243 Whitehorse-road, Balwyn, E.8	290	239
	,, ,, ,, ,,	293	219
40	J. Chatts, White-street, Beaumaris, S.10	238	231
	,, ,, ,, ,,	239	212
39	Tedstone and Rankin, 243 Whitehorse road, Balwyn, E.8	234	215
45	S. N. Lloyd (deceased), Box 21, Frankston	265	227
	,, ,, ,, ,,	266	215
	,, ,, ,, ,,	269	223
44	A. E. Hill, 26 Brenbeal-street, Balwyn, E.8	264	224
42	J. W. Hattwell, 44 Ebden-street, Elsternwick, S.4	247	201
	,, ,, ,, ,,	248	206

SECTION B.—FIRST CLASS CERTIFICATES OF MERIT TO HENS IN CLASSES 1, 2, AND 4, WHICH LAID 240 FIRST GRADE EGGS, AND IN CLASSES 3 AND 5, WHICH LAID 220 FIRST GRADE EGGS.

Pen No.	Name and Address.	First Grade Eggs.
	Class 1.—White Leghorns—Wet Mash.	
26	J. W. Hatwell, 44, Ebden-street, Elsternwick, S.4	261
44	T. A. Mentiplay, Somerville	259
43	,, ,, ,, ...	258
1	E. Abikhair, 41 Wilfred road, Ivanhoe, N.21	257
17	A. T. Dent, Sellars-street, Greensborough	256
48	T. A. Pettigrove, 159 Hawdon street, Heidelberg, N.22	255
56	Sorrento Farm, Campbell-road, Sorrento..	255
9	J. Chatts, White-street, Beaumaris, S.10	254
49	P. Phelan, 11 Traill-street, Northcote, N.16	254
61	T. A. Welch, corner of Bayswater-road and Central-avenue, Bayswater	254
85	A. R. Davey, Edward-street, Greensborough	254
7	T. Birchall, 180 Harold-street, Thornbury, N.17	252
52	W. H. Rayner, 85 Regent-street, Preston, N.18	252
16	W. B. Corker, Bruthen	250
76	W. F. Rogers, 28 Innellan-road, Murrumbeena, S.E.9	242
18	A. T. Dent, Sellars-street, Greensborough	241
80	A. S. Cook, 42 Loch-street, East Geelong..	241
40	Maroo Poultry Farm (B. Prendergast), 30 Maroo-street, Oakleigh, S.E.12	240
74	A. and L. Caspar, Main-street, Bacchus Marsh	240

Section B.—First Class Certificates of Merit—*continued.*

Pen No.	Name and Address.	First Grade Eggs.
	Class 2.—White Leghorns—Dry Mash.	
221	M. G. Skinner, 75 Vincent-street, Sandringham, S.8	251
219	P. Phelan, 11 Traill-street, Northcote, N.16	241
	Class 4.—Australorps—Wet Mash.	
116	J. J. Herbert (deceased), 13 Dunn-street, Wonthaggi	293
111	C. E. Graham, Portarlington	259
131	Mrs. W. S. Savory, 170 Prospect Hill-road, Canterbury, E.7	257
136	D. and J. Tresise, Serpentine	256
129	N. R. Savory, 170 Prospect Hill-road, Canterbury, E.7	253
100	Avonlea Stud Poultry Farm (J. Aitken), Silver-street, Cheltenham, S.22	244
127	P. Phelan, 11 Traill-street, Northcote, N.16	243
125	T. A. Pettigrove, 159 Hawdon-street, Heidelberg, N.22	240
	Class 5.—Rhode Island Reds—Wet Mash.	
178	G. Winter, "Dunehurst," Murgheboluc ..	223
172	A. and G. Turnbull, 103 Locksley-road, Ivanhoe, N.21	222

FOR INDIVIDUAL BIRDS, IN BOTH SECTIONS A AND B, THAT LAID THE GREATEST WEIGHT OF EGGS.

Pen No.	Name and Address.	Bird No.	Total of all Eggs.	Weight of Eggs.
	SECTION A.—TEAMS OF SIX BIRDS—TRAP-NESTED.			
	Class 4.—Australorps—Wet Mash.			
	First Prize—Champion Certificate.			
55	J. J. Herbert (deceased), 13 Dunn-street, Wonthaggi	329	309	676·2 oz. (42 lb. 4·2 oz.)
	SECTION B.—INDIVIDUAL BIRDS—SINGLE TEST.			
	Class 4.—Australorps—Wet Mash.			
	Second Prize—Government Certificate.			
116	J. J. Herbert (deceased), 13 Dunn-street, Wonthaggi	116	293	655·9 oz. (40 lb. 15·9 oz.)
	Third Prize—Government Certificate.			
102	F. W. Becker, Follett-road, Cheltenham, S.22	102	318	650·6 oz. (40 lb. 10·6 oz.)

The number of eggs shown above was the total number laid by each of these birds.

White Leghorns entered by E. J. Marchant, 56 White-street, Mordialloc, were bred by W. Cullen.

Australorps entered by W. J. Weston, 104 Broome-crescent, Wonthaggi, were bred by W. J. Macauley.

The Brown Leghorn entered by J. Granter, 163 Martin-street, Gardenvale, was bred by D. Granter.

Garden Notes

By A. W. Jessep, M.Agr.Sc., B.Sc., Dip. Ed.,
Principal, School of Horticulture, Burnley

WITH the cold weather approaching, it is becoming rather late for planting out winter flowering annuals. It is advisable, therefore, that home gardeners should endeavour to complete transplanting this month.

Further plantings may be made of the following seedlings:—Calendula, Iceland poppy, viola, pansy and carnation. A sheltered spot for such seedlings as cineraria and primula malacoides is desirable. Although these annuals make a good display of colour, the perennial bulbous plants are very useful and deserve a place in any garden, particularly in the drier areas. Make plantings this month of any of the following:—Daffodil, tulip, hyacinth, ixia, ranunculus, anemone, and freesia.

The area which has been prepared for the lawn should be given a final forking over and levelling ready for sowing the seed early this month. It is essential to have a fine, well-consolidated seed bed, as free from weed seeds as possible. The seed to sow depends upon the environment, and the attention the lawn will receive. One part of New Zealand Brown Top with 2 parts of Chewing's Fescue, sown at the rate of ¾-oz. per square yard gives an attractive fine lawn, but it requires careful management to keep it so. For a good average lawn, a mixture consisting of 1 part of New Zealand Brown Top, 2 parts Chewing's Fescue, and 3 parts Kentucky Blue, sown at the rate of 1 oz. to the square yard, is very satisfactory. If the lawn is sown in early April, it should become well established before the winter, and is better able to withstand the first summer than when sown in the spring.

Established lawns are sometimes attacked by the cockchafer grub. This insect pest eats the roots of grasses and may gradually kill out the lawn. The grubs may be controlled with arsenate of lead powder. To a barrow load of moist top-dressing soil add 5 lb. of arsenate of lead powder. This is sufficient to broadcast over each 110 square yards. Repeat every two or three years until the pest is wholly eradicated.

April is the best month to plant ranunculus and anemone. The area should be well prepared, and if farm-yard manure is available, work it into the ground three or four weeks before planting. These plants do well in any average type of soil if it is well drained and not sour. They prefer an open position—particularly the anemone, which is sometimes called Scarlet Wind.

Plant the corms about 6 inches apart in rows with 18 inches between the rows, or in clumps of selected colours about 9 inches

between the corms. With the ranunculus, the claw or root end should be planted downwards and firmly pressed into the ground so that the crown is about 2 inches below the surface. The anemone has no claws, but a crown with a slight tuft of hairs. The roots appear from the opposite side to the tufts, so be sure and plant with the tufted crown uppermost and about 1½ inches below the surface. When the corms are obtained, they are shrivelled in appearance. Place them between damp sacking for about 24 hours before planting. This makes them swell and starts their growth. During the flowering period, they respond to liberal watering.

After the flowering period is over, they should be allowed to die down. The corms are then lifted, cleaned, and stored in a dry airy shed. The best flowers are usually produced in the second year, therefore the corms should be replaced every second or third year. If grown from seed, it is advisable to cull out any unsatisfactory plants the first year.

Varieties.—There are numerous varieties of ranunculus and anemone on the market, but they are mostly sold under the nursery trade name, with the name denoting the colour added to it, such as Claremont Scarlet Emperor Anemone.

Ranunculus.—Huntsman, red tones; Sunset, bronze and apricot tones; Golden Glory, bright yellow; Bonnie Lassie, bright pink.

Anemones.—Blue Admiral, large blue; Scarlet Emperor, scarlet; Blue Bonnet, blue; His Excellency, bright scarlet.

In addition to these named varieties, mixed colours may be obtained and these are often preferred.

Vegetables.

With the approach of the cold weather, the pumpkin and melon vines usually become attacked by mildew. The pumpkins and melons should be carefully removed and stored in a dry shed. Always leave the stalk on the pumpkin when removing it from the vine, as it keeps better than if the stalk is broken off. The first frosts will kill the vines, which then may be removed and the area cleaned up ready for its winter treatment.

Further sowings of broad beans, peas, beetroot, carrots, and parsnips may be made. Transplant cabbages, cauliflowers, and Brussels sprouts.

The asparagus bed requires attention now. Cut off the tops at ground level and give the area a good clean up. Fork it over, taking care not to injure the crown of the plant. Give a liberal dressing of farmyard manure. The use of salt as a dressing is sometimes advocated, and although asparagus will grow under saline conditions, the addition of salt to the soil does not improve its growth and therefore is not recommended.

April is a suitable month to commence the preparation of an asparagus bed. When once planted, it should last for many years, so that the preparation of the area should be thorough. Select a good open and warm position, so that the crowns will commence growth early each spring. Half trench the ground to a depth of about 2 feet, taking care not to bring the subsoil to the surface. Work in a liberal supply of organic manure, especially cow manure if available.

In June, fork the area over to destroy any weed seeds. In July, finally prepare the bed ready to receive the asparagus crowns. Plant the crowns in July-August, in rows 2 feet apart and 15 to 18 inches between the plants in the row. In September each year, give a dressing of sulphate of ammonia, at the rate of 2 oz. per square yard scattered evenly over the area, and water in well. After the first year, the stalks may be cut from the time they appear until November. The foliage should then be allowed to develop until the autumn.

Orchard Notes

By J. L. Provan, B.Agr.Sc., Senior Horticultural Instructor

THE new season's navel oranges will be picked during the present month. They may not have attained much colour yet. In fact, frequently they are still green, but in some localities they are palatable and supply the small demand for citrus fruits at this time of the year. When picking, growers should only harvest fruit 3 inches or more in diameter with a high juice content. It is advisable to submit samples to packing houses in order to ensure that the fruit complies with the maturity and juice

regulations. Growers should not on any account harvest fruit which does not comply with the regulations, and which, after "gassing" in ethylene, does not acquire reasonable colour. Poor-coloured, almost anaemic-looking fruit, low in juice content and fairly acid, undoubtedly depresses early market sales. Last season, difficulty was experienced in colouring early navel oranges. While this was mainly a seasonal effect, it was also noted that some growers had endeavoured to colour fruit which normally would not have been submitted to this ethylene gas treatment. A preliminary gas test with small samples should be made before commercial harvesting commences.

The problem of the "dry" Thompson navel has yet to be solved by Victorian citrus growers. In most cases where this variety is grown, it would be advisable to commence re-working the trees during the coming season. Growers who desire information on how to re-work these dry-type Thompson navels should communicate with the local orchard supervisor during the winter months. The cutting back of these trees should be done during August. This will give time for young growth to appear during September and to develop to a sufficient stage for budding by the following autumn.

The month of April is also preferred by many citrus growers for spraying against Black and Soft Brown scales. White oil emulsion spray, 1 in 40, will effectively control both these scale pests. If aphis is also present on the trees, the addition of half a pint of nicotine sulphate to 40 gallons will destroy this pest also.

Citrus trees which are showing signs of ill-health should be carefully inspected, particularly around the trunks. It is inadvisable to allow trees affected with collar rot at this time of the year to remain untreated throughout the winter. In addition to removing the diseased portion of the bark and wood and carefully collecting the chips, a Bordeaux mixture paste should be applied to the wound, and the top of the tree should be pruned back in order to compensate for the restricted sap flow occasioned by the wound on the trunk. The Bordeaux paste should be made up of equal parts of bluestone and lime with sufficient water to form a fairly soft paste.

The attention of passion fruit growers is drawn to the packing chart for this fruit issued by the Department of Agriculture. This chart contains information on the packing of passion fruit in the long bushel and half long bushel, half dump and the half standard cases. The advantage of the half standard case, the dimensions of which are 18 inches x 5¼ inches x 11½ inches, is that exact dozens of fruit can be packed, e.g., 16 dozen, 17 dozen, and so on per case. Passion fruit growers who have used this case find it most suitable for the local and interstate markets.

Walnuts will be harvested during the month. Good clean samples usually can be obtained if they are picked up regularly, de-hulled if necessary, and dried thoroughly under shady and airy conditions. Stained nuts can be bleached with a solution which consists of 25 lb. of chloride of lime, 18 lb. of washing soda, and 50 gallons of water. This mixture is allowed to settle after mixing and the clear liquid is drawn off, and to this clear liquid sulphuric acid is added at the rate of 1¼ lb. to 425 lb. of the solution. The nuts should be immersed for only five to ten seconds. They should then be spread out thinly in order to hasten drying.

Poultry Farming

One of the most common faults in the keeping of poultry for egg production is under-feeding. If a fowl is to produce eggs regularly throughout the year she must receive plenty of good plain wholesome food. A great deal of the food consumed is required for bodily maintenance and it is only after this has been provided that there is any available for egg production.

Some birds if liberally fed will become fat and lazy, but restricting their rations will not make them lay. They should be culled out and sent to market for table purposes. On the other hand, the good layer—the bird that has been bred for egg production—does not go to fat, because it is her nature to produce a large number of eggs and so much of the food is used up for that purpose.

Twenty years of feeding tests at the State Research Farm, Werribee, have shown that, for egg production, poultry should be given as much as they will eat at each feed time. That amount will vary slightly, but a laying fowl will eat approximately 2 oz. of mash (dry) and 2 oz. of grain per day.

Reclaiming Beeswax

Apiary Methods

By J. S. EAGLAND, Apiary Inspector

BEESWAX is a fatty secretion of the worker bee, and is produced in small cavities in the ventral plates of the abdomen. It has been used by the human race for various purposes for thousands of years, and yet to-day it is still produced commercially only as a by-product of honey.

The production of wax by the honey bee is in a certain ratio to that of honey; thus, bees in trees or box hives yield, on the average, 1 lb. of wax to 20 lb. of honey. With the introduction of the frame hive, and the method of extracting the honey from the combs and returning them to the hive to be refilled with honey by the bees, the ratio of wax to honey has been considerably altered and stands at 1 to 80. In other words, the production of extracted honey for the same weight of wax is four times that of the primitive method of cutting out the combs to obtain the honey. The wax is the product of a transformation of the honey or nectar when retained in the body of the bee for a time under certain conditions. Many attempts have been made to turn surplus honey into wax by feeding it back to the bees, but none has proved successful from a commercial point of view. While, therefore, the proportion of wax to honey cannot be profitably increased, so far as its production is concerned, there is room for much improvement in the methods of obtaining the wax from the combs, in the handling, refining, and marketing.

In years of low prices the effective reclaiming of beeswax is economically limited to that portion most easily obtained; but at times of high prices, like the present, it becomes advisable to devote more attention to the efficient saving of all waste apiary matter containing beeswax, as well as thorough pressing of all refuse from old combs or cappings.

Thousands of pounds of beeswax are thrown away annually, or burned with old black brood combs, because the old-fashioned method of boiling the combs in a bag submerged under water fails to obtain more than a mere fraction of the wax contained in them. New comb consists entirely of wax, and is white or yellow in colour according to the flora from which the bees obtain the nectar converted into wax. When brood is reared in the cells the comb first becomes brown and, after a time, black, tough, and heavy. Each bee larva, before changing to the chrysalis stage, spins a cocoon, and as generation succeeds generation in the same cells old brood comb contains numbers of these in each cell, one inside the other; but although the appearance of the comb is entirely changed, the original wax cells are still there. When old brood comb is dissolved by boiling in water, each of the cocoons set loose by the melting of the comb becomes coated with liquid wax which clings to the fibrous material of the cocoons, and but little will rise to the surface when boiled in a bag kept under water.

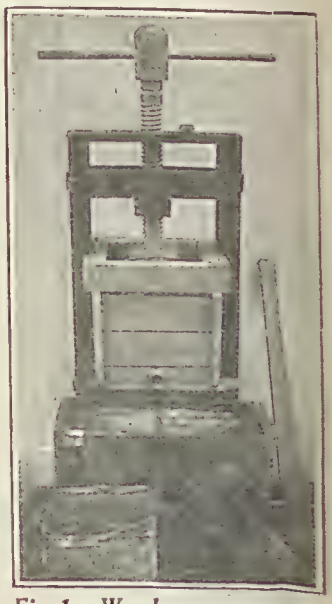
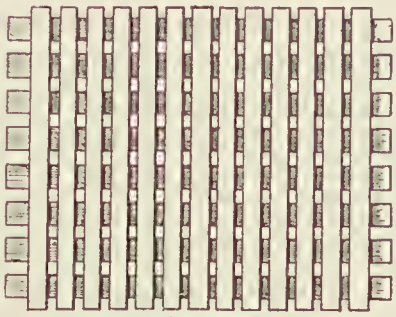


Fig. 1.—Wooden wax-press.

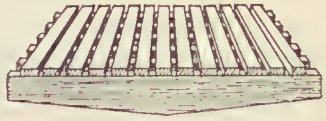
To obtain all the wax, or at least the maximum from old combs, pressure is required —something of the nature of a cheese press. The press shown in the illustration (Fig. 1) is a stout wooden box securely bolted together and lined with tin; inside of this is a slatted grating and bottom, leaving a chamber of 10 x 10 inches (12 inches deep) into which an ordinary sugar-bag or lower part of a cut-down cornsack is inserted. The old comb is dissolved by boiling and poured into the bag, the latter is then folded down, the press block put on, and the screw gradually worked down. Water and

wax escape by the outlet into a separating tank which retains the wax, but allows the surplus water to escape.

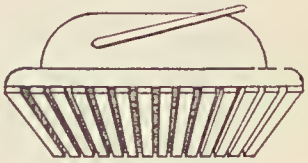
Fig. 1 shows the press complete, with a board fastened across the top of the uprights with a hole to guide the screw, so that it will work evenly and steadily. The uprights should either be securely fastened to the floor of a little platform or braced to the wall by stays at the top.



(c) Top view of bottom.



(d) End view.



(e) Press block.

Fig. 3.—Sections of press box.

The frame consists of two uprights, about 2 ft. 8 in. long, made of 6-in. x 2-in. timber, with cross piece of similar dimensions at the top, and a floor piece 12 inches wide near the bottom, the four being mortised and bolted together at the intersections, the screw block being slightly let into the cross piece and bolted. The screw is a 2-in. wooden carpenter's bench screw, but a 1¼-in. steel screw is more durable. The body of the press is made of ⅞-in. shelving, blocked or dovetailed together at the corners, and measures 11⅜ inches x 11⅜ inches inside by 12 inches deep. The bottom is fitted into the body flat on the underside; the upperside has an incline of 1 inch from the sides to the groove in the centre, which latter inclines towards the outlet in front, as shown in Fig. 2 (a). A frame 3 inches wide runs round the top of the body, bracing it together and projecting upwards by 1 inch over the top edge of the body, forms a rabbet ⅞ inch x 1 inch. The whole body is lined with tin inside, the groove terminating in a spout. Figs. 2 (b) and 3 (c), (d), and (e) show the fittings inside the lining. Fig. 3 (c) is the bottom of the grating, made of pieces of wood ⅞ inch thick and 1 inch deeper in the centre than at the ends, to correspond to incline of the bottom of the body, on the lining of which they rest. They are ½ inch apart, and slats ⅞ inch wide by ⅝ inch thick, set 3-16th inch apart, are nailed crossways on to the top of them as shown in Fig. 3 (c).

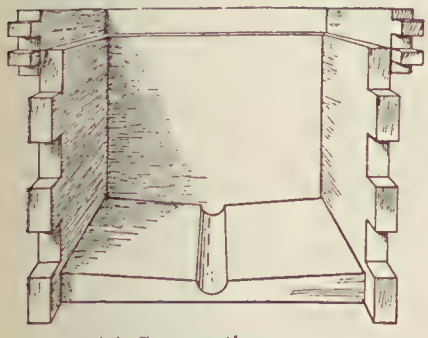
Fig. 2 (b) shows the four sides of the grating, each of which is unconnected with the others, and consists of slats ⅞ inch x ⅝ inch, set 3-16th inch apart, nailed on to a piece 1 inch x ⅞ inch at top, which rests on the rabbet at top of body, when inserted in the latter. A doubled piece of tin in a saw-cut made endways into the slats connects them at the bottom without obstructing the passage of the liquid pressed.

Fig. 3 (e) is the press block, made of a piece of hardwood, with stout iron handle, which is raised and a lever put through when the block is to be lifted. A board ⅞ inch thick and measuring 10 inches x 10 inches (which is the clear measurement inside the grating), fastened to the hardwood block, has slats the same as the sides of the grating.

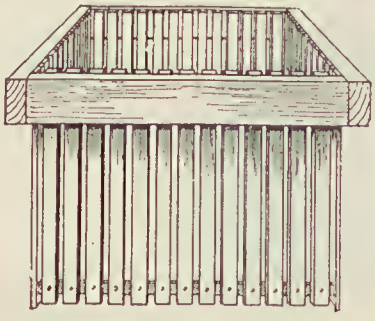
This press may be used also as a cappings press or for pressing honey out of combs, in which case a piece of hessian sufficiently large to lap over double, when the press is full, is tucked into the grating. If there is any difficulty in getting the pressed cake out of it, it is overcome by drawing out one or two of the sides of the grating.

To obtain the wax from old combs, pressed or strained cappings, or refuse, a bag, similar to the lower portion of a sound cornsack, is most commonly used.

The material containing the wax is placed in tins of water and heated until thoroughly



(a) Cross section.



(b) Inner slated sides.

Fig. 2.—Sections of press box.

melted. Before pouring the slurry into the bag in the press, a couple of gallons of boiling water should be poured through the bag to heat and saturate both it and the woodwork of the press and so prevent any of the wax adhering to them. When not yet fully pressed down unscrew, lift out the press block, shake up and fold the bag afresh, and press again, or pour in more if there is but little refuse. The liquid wax and water run into a receptacle standing under the spout, and are separated by means of a separating tank described further on.

There are several types of wax presses, and while a wood-slatted one, as the one described, is preferable, its construction requires a certain amount of skill and handiness with tools not possessed by every bee-keeper. A press made almost entirely of metal is obtainable from dealers in bee-keepers' supplies. Fig. 4 is the press ready to set up.

The amount of wax obtained from the old combs by means of a press, as compared with the old method, is as three to one, while the time occupied is but one-tenth, and the wax obtained is ready for market if drawn off into suitable moulds.

About 75 per cent. of the wax sold by produce salesmen is depreciated in value through having been wrongly treated at the apiary. Wax should never be overheated; it should always be melted or boiled with water. Wax boiled in rusty tins or iron vessels has a dirty brown appearance; contact with galvanized iron or zinc turns it grey, copper green. Bright, new tin or tinned copper vessels are the only ones which do not affect the colour and character of wax. Even the oldest comb will produce wax of a clear yellow or orange colour if properly treated. The size and shape of the blocks of wax seen on the market also leave much to be desired. The moulds used by many bee-keepers are buckets, old milk-dishes, kerosene-tins, wash-tubs, &c., into which the wax has been poured, and left to set quickly in contact with the metal instead of on hot water. The result is that the dirt, which will pass through even the finest strainer, is diffused all through the lower part of the wax instead of being in a separate layer, which can be scraped off. Quick cooling results in unsightly cracks and clinging to the moulds. Wax is often sent to market in bags, and the fibre and dust adhering to it still further spoil its appearance. Blocks or cakes should not be larger than 20 lb.; 10 or 12 lb., however, is the best weight.

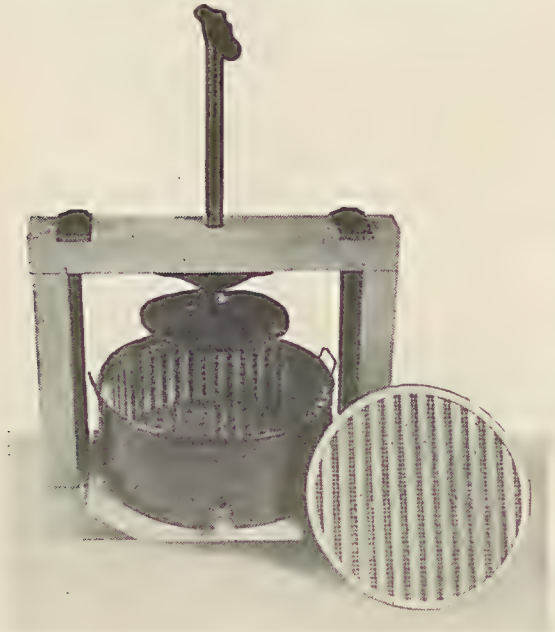


Fig. 4.—Metal wax-press ready for use. Upper portion or press block is shown at right.

Better attention to the saving, proper handling, and marketing of beeswax would well repay the bee-keeper, and add considerably to the total annual value of production.

When an apiary has been in existence for a number of years it becomes necessary to replace some of the old black brood combs. Portion should be replaced every season—whenever an opportunity offers to withdraw them from the brood-chamber.

A Langstroth comb, if built on a full sheet of foundation, contains about 3 oz. of wax when new, but somewhat more after it has been in use for some years, as the bees add wax after the foundation is first drawn out. When very old combs are boiled down for wax, not more than eight should be put into each tin with 3 gallons of water; otherwise the mass becomes too stiff and difficult to press clean of wax. Sometimes, hundreds of combs have to be cut out and boiled down and a great number of vessels would be required to hold the water and liquid wax coming from the press until the wax is set, unless it is skimmed off while hot, which is tedious work.

By the use of a separating tank, wax and water can be separated automatically, the wax being retained in the tank while the waste

water, if not too thick and black, can be used for boiling down more combs or else at once disposed of. Waste water from boiling down combs or water containing honey should not be thrown out so that bees will have access to it, but should be buried; apart from any risk of spreading disease, it may start robbing or stinging.

This separating device (Fig. 5) consists of a plain box lined with tin. One corner of the lining is covered by an L-shaped piece of tin soldered to the side and end, open on top and reaching only to within half an inch of the bottom, with an outlet stud through the end board of the case about 4 inches from the top. At the opposite corner of the case is another outlet stud 2 inches from the top.

Before allowing the wax to run into the tank from the press, sufficient hot water should be poured in to cover the end of the enclosed corner so as to prevent the wax escaping into it. After several lots of boiled comb have been put through the press, the wax and water will have risen in the tank to the level of the outlet tube A, and from now an amount of water, equal in weight to the water and wax coming from the press, will run over by tube A.

As wax is considerably lighter than water, it does not displace water by its own volume, and therefore rises in the main body of the tank as it accumulates until it reaches the wax outlet tube B. This is best kept corked till it is desired to draw the wax into moulds or a cooling vessel, when by opening the wax tube B and closing the water outlet A the whole of the accumulated wax flows over when more liquids run into the tank from the press or sufficient hot water is poured into it.

A serviceable tank of this description can be made out of a kerosene case and two tins

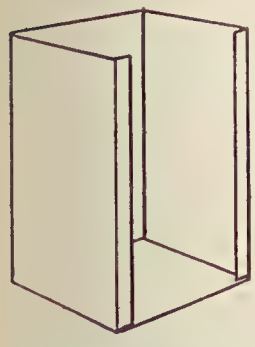


Fig. 6.—A section of the separating tank.

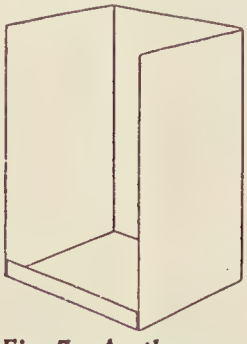


Fig. 7.—Another section of the separating tank—lining of tank.

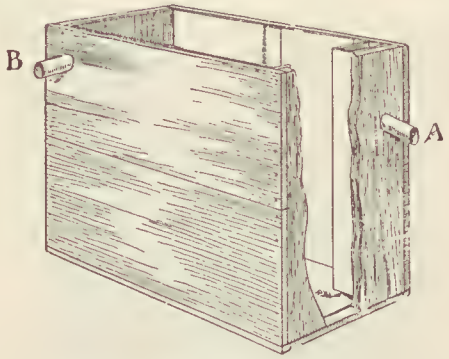


Fig. 5.—Separating tank.

by any one able to use a soldering iron. Cut the tops out of the kerosene tins, close to the rim, and hammer back the cut edges. Then cut the side out of one tin, as shown in Fig. 6, and the other as in Fig. 7; put the tins into the case, straighten out the pieces left for lapping over in Fig. 6 and the bottom piece in Fig. 7; then solder together. Withdraw the lining from the case, cut the holes for outlets A and B into lining and case, reinsert the lining and solder on the studs (which should be at least 1 inch in diameter) and the angle piece covering A. The work is then completed.

This receptacle, if emptied and wiped dry after use, will last for many years, as wax has a protecting influence on tin. It will save a great deal of labour by dispensing with skimming and remelting; water will also be saved, an important consideration to bee-keepers who are located in dry districts.

The use of the solar wax extractor appears to be almost totally neglected in this country, and yet, with the large number of sunny days of our northern districts, much of the scraps of comb thrown away could easily be converted into wax by its use.

The Solar Wax Extractor.

The solar wax extractor will not efficiently separate all of the wax out of refuse or old combs, but, with small amounts of material which do not justify pressing, it will get most of the wax at no cost except a little supervision.

The machine consists of a shallow wooden tray of any convenient size, 2 feet to 3 feet square by 2 inches deep being that most used. The tray is metal-lined, with a 2-in. outlet fitted into the bottom at one end.

Solar wax extractor with the glass raised, showing residue after exposure to heat of the sun.

The lid of the tray consists of a wood and glass cover similar to a window, but fitted with double glass spaced ½ inch to 1 inch apart. It is necessary to bore a small hole through the wooden frame of the lid at the lower end in such a position that it allows air, when expanded by the heat of the sun, to escape from between the sheets of glass.

When the tray is placed on the slope in a position to cause the sun's rays to strike directly on to the glass, the heat generated inside the container is so great that it melts the wax and so allows it to drain slowly from the outlet.

To retain the maximum heat in the container, shelter from wind is advisable, while packing the joint between cover and tray with felt or rubber is necessary to prevent excessive air circulation with consequent loss of heat.

The laying of a piece of ridged wire gauze in the bottom of the tray will allow efficient draining while preventing the residue from sliding down to the lower part of the tray and so blocking the outlet, or passing out into the vessel placed to catch the wax.

To get the best results it is important that the total depth from glass to bottom of tray should not exceed 3 inches and that every effort be made to retain the heat in the tray by preventing air leaks as far as is practicable. The work of the extractor is considerably improved by enclosing the wax container and fitting it up closely against the underside of the wood of the tray and so preventing air circulation up through the draining tube, while the mounting of the whole machine on a turntable made from an old cart wheel or similar fitting increases its efficiency by enabling it to be faced directly toward the sun at all periods of the day.

Book Review

The publication, by the Queensland Department of Agriculture and Stock, of Volume 11 of the Queensland Agricultural and Pastoral Hand Book series, is an important addition to Australian horticultural literature.

The book, which comprises 386 pages, is well illustrated and printed in an easily readable type. It is divided into four parts dealing with Tropical and semi-Tropical Fruits, Deciduous Fruits, Vegetable Growing, and Packing and Marketing Fruit and Vegetables.

The author, Mr. H. Barnes, Director of Fruit Culture, with the assistance of his staff, has dealt briefly with all cultural phases of the numerous varieties of fruits grown in Queensland. Horticulturists in other States will be particularly interested in the Tropical and semi-Tropical Fruit section.

The importance of the proper presentation of fruit for the market is stressed, and the one-third of the book devoted to this section should appeal to all growers.

The book is esentially practical, and should materially assist the primary producer by suggesting to him crops which should be grown and supplying information on their culture.

Milking Machines and Dairy Buildings

Requirements of Dairy Supervision Act

By R. T. McKENZIE and H. HENRY, Dairy Supervisors

BY regulation under the Dairy Supervision Act, no milking machine may be installed unless and until a plan of the proposed installation is approved by the Superintendent of Dairying. It is required also that provision be made for the generation of sufficient steam when machines are installed, and that there shall be a 6-ft. unobstructed air-space between cowshed and dairy, walled on both sides. A dairy or milk room must not be attached to the cowshed. Dairy and washroom must be well-lighted and ventilated, fly and vermin proof, and set on 12-in. concrete dwarf walls, the full height of the walls to be 8 feet. Drainage from the cowshed must flow away and not toward the separator room. All stock must be fenced away from the dairy and washroom. Dogs, fowls, pigs, kennels, fowlhouses, pigsties, calf-pens, and stabling must not be within 150 feet of the dairy buildings.

Provision for an abundant supply of water at the dairy must be made. It is preferable that the cowshed and dairy be apart from all other farm buildings. In installing the machines there must be no bends or angles in the milk pipes and pulsator drives, while the vacuum tank should be in an air-space. Machine pipes should be straight and as free from "gadgets" as possible. Many of these latter the makers are putting on as selling points. However, they not only add to the expense, but also form crevices for dirt and make cleaning more difficult. Piping of 18-gauge approved stainless steel is the best material for machines. If this is not obtainable, then brass tubing nickelled on the outside and well-tinned internally may be substituted. The success or otherwise of a machine depends on the operator. It is not advisable to work more than 6 units with one pump, or to extend air lines for bucket plant over 80 feet, otherwise trouble can be expected in some form or other. Another factor in success with machines is cleanliness.

Investigations into the cause of cream faults and excessive bacterial counts in milk have demonstrated that by far the most fruitful source of contamination of milk and cream is the use of non-sterile utensils. This has been the experience not only in our own State, but is common to most countries of the world wherever investigations have been made. The extensive use of milking machines has accentuated the trouble because of the difficulty of maintaining them in a sanitary condition. Recent investigations carried out have shown that in many instances milk produced on farms operating milking machines was definitely inferior to that produced on farms where hand-milking was practised.

It may be that the large increase in the use of mechanical milkers in this State, and the failure to thoroughly cleanse and sterilize this equipment, will have a marked influence on the percentage of choicest butter. In justice to the milking machine, however, it should be stated that, if installed and operated correctly and cleansed according to an approved hygienic technique, there is no reason why the quality of milk should not be equal to or even superior to that obtained by hand.

Of the many methods used in cleansing milking machines, the caustic soda and boiling water method embracing steam sterilization has been found to be particularly efficacious. Either washing soda or caustic soda may be used. Care must be observed in using a soda solution, for, should any find access to the milk or be allowed to remain in piping or utensils, the result is certainly harmful. Damage also might be done to tinware by using caustic soda solution too strong. Promptly and completely remove all traces after use by washing out with hot or boiling water.

In cleansing machines, the quantity of boiling water required is not excessive, but it must be *boiling* and not merely hot or warm.

The caustic or washing soda solution must be well-stirred and thoroughly dissolved in the boiling water. The outside as well as the inside of the rubbers must be kept clean, otherwise their life will be shortened. Rubbers, after cleaning, should be laid out without bends or twists. It should be noted that Departmental regulations provide that a steam boiler giving sufficient steam pressure is essential where milking machines are installed. To operate the method successfully, the work must be done

immediately after milking. It must be borne in mind also that it is necessary to keep the airline clean and sweet, just as surely as it is necessary to keep the milk line free from all contamination—a dirty airline will affect the quality of milk, as also will a dirty pump. Some manufacturers are now putting a pump on the market which they claim can be washed and sterilized efficiently—this will be an advantage.

The Cleansing of Milking Machines in Position.

Material and Appliances Required.

1. An abundance of clean cold water.
2. Boiling water and steam.
3. Wash trough, scrub brushes, ball of horsehair or travelling brush, and caustic or washing soda.
4. Dairy thermometer registering at least 212 degrees Fahrenheit.

Application of Method.

1. Before milking, draw cold sterile water through the teat cups and milk lines (this will help to prevent milk adhering to the pipes).
2. After milking, draw cold or tepid water through the milk system to wash out all milk lines before applying heat.
3. Scrub off all dirt from the outside of the teat cups.
4. Put the releaser out of milking action by stopping the pulsator at a point that will cause the outside flap on the releaser to sit tight. Then draw through each set of teat cups at least 1 gallon of boiling caustic solution (strength of the solution 1 full tablespoon of caustic soda to 4 gallons of boiling water). On drawing it through the set furthermost from the releaser, carefully lift the flap or plug of the end of the main milk pipe and insert a 6-in. length of plaited horsehair or travelling brush, holding the same until the vacuum pressure again rises, and simultaneously remove the plug for a moment and allow the horsehair or brush to whisk into the releaser. The releaser becomes full and the overflow travels into the vacuum tank. Next place an empty bucket under the releaser, break the vacuum by removing the plug from the end of the milk pipe, allow the contents of the releaser to discharge into the bucket, then replace the pipe plug.
5. To remove all traces of the soda solution, immediately draw through each set of teat cups at least 2 gallons of boiling water. Both the soda solution and boiling water are applied with best results by dousing the teat cups in and out of the liquid. This causes an inrush of air and flushes the walls of the pipes. In addition, as a result of stopping the pulsator, the hot water is retained in the system, which is heated to a maximum temperature.
6. *Vacuum and air system.*—Detach the air rubber tubing from each claw and place the ends in boiling caustic solution and draw at least 1 quart through each, then rinse with clean boiling water. The water will pass through the tubing under the pulsator slide into the main vacuum pipe, and thence into the vacuum tank.
7. Next, detach the air pipe from the rubber tube connecting it with the outer chamber of the releaser and draw through a quart or more of boiling caustic solution, followed by some clean boiling water. These fluids will also travel to the vacuum tank.
8. Where steam is available, the steam hose should be inserted and the pipes subjected to live steam for a few minutes.
9. Before stopping the machine, allow the teat cups to draw air for a few minutes, remove and replace the plug on the main line two or three times to cause an inrush of air to carry away all surface moisture, drying and sweetening the line.
10. Leave all taps and ends open to allow the free circulation of air.
11. Scald and scrub vacuum tank.
12. Dismantle releaser and scrub and scald.

It should be noted that the cleansing of machines in position does not obviate the necessity for the frequent dismantling of drop tubes, teat cups, and claws for manual cleaning; also that cleansing immediately after milking twice daily is essential.

The injurious effect of the fatty constituents of milk on rubber constitutes one of the problems in the care of machines, and constant attention to these parts is required. The following treatment is advised. All rubber portions (this includes inflation stoppers and releaser rubbers) should be taken off the machine and boiled in a caustic solution (1 tablespoonful to 4 gallons of water) once weekly. Care must be taken not to allow the rubber to come into contact with the hot metal while boiling. Place the rubbers in a canvas or sugar bag; after boiling for a few minutes, transfer to pure boiling water to remove the caustic solution, and allow to cool down slowly. This will lengthen the life of the rubber considerably, keep it in a workable condition, and prevent it from becoming foul and sticky.

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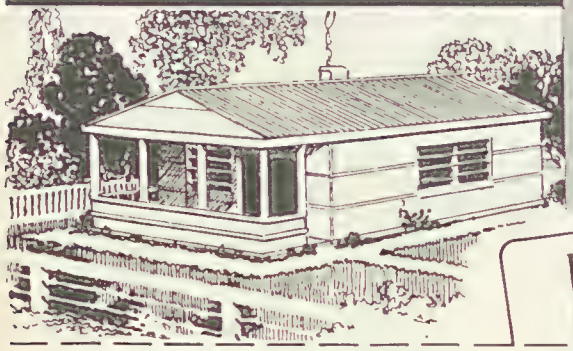

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The Journal of the DEPARTMENT of AGRICULTURE of VICTORIA

Journal of Agriculture, Victoria—May, 1941.

PASTURE IMPROVEMENT In the North-East

By W. D. ANDREW, M.Agr.Sc., Assistant Agrostologist

THE native pastures in the North-east of Victoria are made up largely of various species of Wallaby grass (*Danthonia* spp.). Kangaroo (*Themeda triandra*) and "Red Leg" grass (*Bothriochloa decipiens*) are still persisting in some places, and in addition there are numerous other species in varying amounts, such as Spear grass (*Stipa* spp. and *Aristida* spp.), Love grass (*Eragrostis* spp.), Windmill grass (*Chloris* spp.), &c.

Although the native pastures are very drought-resistant they are rarely capable of carrying more than a dry sheep per acre.

When this grassland is broken up for cropping, the *natural* pasture which develops afterwards is usually poorer than the original native pasture, as the root grasses, such as Wallaby and Kangaroo, are replaced by short-lived inferior annual grasses and weeds.

The problem of improving pastures, whether native or natural, resolves itself into the introduction of suitable leguminous species, the replacement of the existing grasses if possible with other grass species of a more productive type and the raising and maintaining of soil fertility in order to obtain the maximum growth from the pasture plants.

Rainfall and natural soil fertility are the principal factors which determine how far it is practicable to effect a change, and they largely govern the methods to be used.

The North-east falls naturally into two major divisions. Most of the country east of the Hume Highway has an annual rainfall of 25 inches or more and lends itself to pasture improvement, whereas west of the highway the rainfall decreases rapidly and pasture improvement becomes more difficult and uncertain.

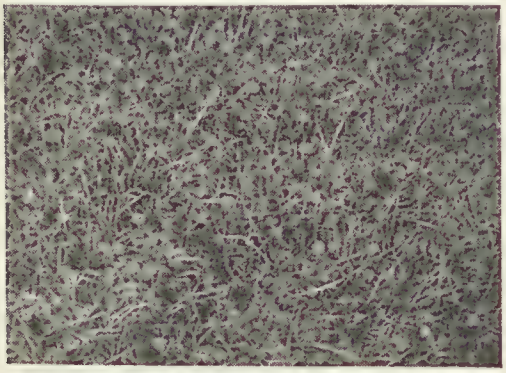
Natural pasture showing volunteer weed species.

CHOICE OF BETTER PASTURE SPECIES AND MIXTURES.

1. Rainfall 25" or more per annum.

Subterranean Clover (*Trifolium subterraneum*) is well suited to practically all soil types in the area with an annual rainfall of 25 inches or more, with the exception of the very heavy clay soils. Generally, the mid-season or "Mt. Barker" strain should be used, but in some of the late districts the "Tallarook" strain could be sown and would provide more grazing in the late spring than the mid-season strain under the same conditions. The usual rate of sowing is 2 to 3 lb. per acre.

White Clover (*Trifolium repens*) is suitable only for the better alluvial flats, and although it does not provide as much herbage for the stock as subterranean clover, it is good quality feed and very welcome in the latter part of the season when the annual clovers have passed their prime. The "White Dutch" type is not recommended for sowing, and for best results farmers should obtain either "Permanent Pasture" or "Mother Strain" New Zealand certified seed. One half to a pound of seed per acre is usually sufficient to establish this clover.



Improved pasture consisting of subterranean clover and perennial rye grass.

Red Clover or Cow Grass (*Trifolium pratense*) will grow satisfactorily under the conditions suited to White Clover, and in addition can persist on looser drier soils. Usually it does not last for more than 6 to 8 years under grazing unless given special attention, but is very productive in the early years of its establishment. If sown alone for a hay crop, 6 to 8 lb. of seed per acre would be necessary, but otherwise 1 lb. per acre is sufficient.

Strawberry Clover (*Trifolium fragiferum*) is most useful in poorly-drained places, particularly where the soil is inclined to be salty and unsuitable for White Clover. It provides feed in the late spring and autumn when many other species are dormant. This clover may be established from roots or by sowing ¼ lb. of seed per acre.

Lucerne (*Medicago sativa*) can be grown on a wide range of soils, provided the land is well drained, and it may be used as a hay crop or for grazing if desired. Because of its deep tap root it can withstand very dry conditions during the summer and is practically independent of moisture in the top soil. From 4 to 6 lb. of seed per acre of the "Hunter River" type is recommended as a general sowing.

Perennial Rye Grass (*Lolium perenne*) is suitable for sowing on the medium to heavy loams, but on most of the lighter hill country it does not hold, at least in the initial stages of pasture improvement. Farmers are warned that sowing uncertified seed may result in very disappointing results. There is not a great amount of difference between the regional strains of perennial rye grass from Colac, Clunes, or Kyneton, and any of these could be used with good results. Of the three, "Clunes" is likely to be the most drought resistant. Sowing at the rate of 6 lb. of seed per acre will produce a good stand of rye grass if conditions are favourable.

For soils on which perennial rye grass would not persist, either because of insufficient moisture during the summer and/or flooding during the winter, **Toowoomba grass** (*Phalaris tuberosa*) or **Wimmera rye grass** (*Lolium* spp.) is recommended. For the first-named 1½ lb. of seed per acre is a usual sowing, and 2 to 3 lb. of Wimmera rye grass seed per acre is sufficient to produce a good stand.

Cocksfoot (*Dactylis glomerata*) could be sown on the deep soils, but, except in the hills where there are frequent summer showers, it does not make a large contribution to the feed. If a cocksfoot dominant pasture is desired, 10 to 12 lb. per acre should be sown, otherwise sow only 4 to 6 lb. per acre in the mixture.

The certified "Akaroa" or Gippsland leafy strains are recommended in preference to the short-lived stemmy Danish strain.

Golden Crown Grass (*Paspalum dilatatum*) would be suitable for sowing at the rate of 2 lb. per acre on flats which retain moisture during the summer or on sandy soak areas. It develops very slowly in the first two years.

Kikuyu Grass (*Pennisetum clandestinum*) roots could be planted under the same conditions as would be suitable for *paspalum dilatatum*, but should be kept away from cultivated areas as this species is difficult to eradicate.

On winter-flooded areas where the water recedes during the summer, **Silt grass** (*Paspalum distichum*) would luxuriate and provide excellent grazing during January, February and March.

Reed Sweet Grass (*Poa aquatica*) could be tried in permanent swamps, with the idea of it competing with the reeds and providing a useful bulk of fodder for cows in the late summer.

The three last-named species are established by planting out roots, as seed is not available commercially in Victoria.

2. Rainfall 20" to 25" per annum.

Subterranean Clover is a most important pasture plant in districts where the annual rainfall is between 20 and 25 inches, and can be easily established on most farms by sowing 2 to 3 lb. per acre. The mid-season strain is generally suitable for sowing where the rainfall is above 22 inches per annum, but below this figure its persistence is uncertain and "early

Introducing better pasture species into native grassland by means of the combine.

Note the development of subterranean clover on the left, due to the application of superphosphate. The area on the right was missed by the manure spreader which was of a direct-drop type.

mid-season" strains, such as "Mulwala," "Springhurst," or "Bacchus Marsh," are likely to be more successful.

Of the perennial legumes **Lucerne** is the only one likely to persist and it could be sown over a wide area, provided well-drained sites are chosen. For the establishment of a grazing paddock 1 to 2 lb. of seed per acre would be a suitable sowing.

Perennial Rye Grass is not recommended as, generally, it does not persist under close grazing, but **Wimmera rye grass** is very suitable as it can be easily established from a sowing of 2 to 3 lb. per acre, and it readily re-establishes from seed each year.

As an alternative to Wimmera rye grass, **Phalaris tuberosa** could be sown at 1½ lb. per acre, but this grass will not persist under heavy continuous grazing with sheep.

3. Mixtures.

Although most of the foregoing species are compatible, simple mixtures of grass and clover should be the aim.

Phalaris tuberosa and perennial rye grass are capable of growing in association, but are best sown in different paddocks. Lucerne and "phalaris" may be sown together in the better rainfall areas, but where soil moisture is very restricted during the summer the lucerne generally takes the lion's share and the "phalaris" dies from drought.

Quality in seed is more important than quantity, and farmers are strongly advised to use Government Certified seed.

METHODS OF ESTABLISHING THE BETTER PASTURE SPECIES.

A quick but expensive method of establishing pasture species is to plough early in the year or late in the previous year and work the land down to a fine tilth for an autumn sowing.

This should be delayed long enough to allow the first crop of weed seedlings to be destroyed by cultivation, and the seed mixture can then be sown while the ground is warm and followed by a light harrowing. Rolling is useful in compacting the seed bed although not absolutely essential.

On crab-holey country it is desirable to level off the ground before sowing by using some form of grading implement, such as a smooger or road grader.

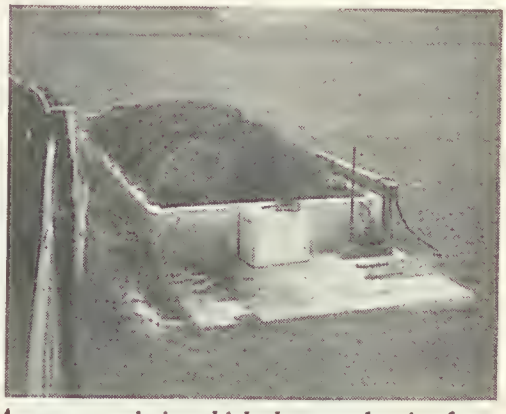
It is more economical to sow a lightly seeded cereal crop at the same time as the pasture seed to offset the cost of the cultivation. In many places the land is cropped for one or two years before being finally sown down to pasture under a cereal cover crop.

A convenient method of seeding is to mix the pasture seed and manure and sow this through the manure runs with the hoses free of the hoes or discs while the cereal seed is sown in the ordinary manner. This prevents the grass and clover seeds from being buried too deeply. On medium to heavy loams new species can be introduced into a natural pasture merely by "combining" in a mixture of manure and pasture seeds without going to the expense of ploughing. A light seeding of oats

could be sown at the same time to provide some supplementary grazing during the first year. This method could be used also on native pastures provided the paddocks were well-grazed out and sharp narrow points used on the combine. One advantage of "combining" without ploughing is that only part of the native root grass sward is destroyed and there is some grazing available from the paddock while the sown species are becoming established.

Broadcasting seed and manure is often quite satisfactory on light country, and another method sometimes used is to feed good quality hay to the stock. Many seeds pass through the alimentary canal undigested and readily strike in the animal droppings.

Natural pastures often contain annual trefoils and clovers which need only top-dressing to make them prominent, and provided suitable species are present this treatment is all that is necessary to develop a satisfactory sward.



A manure pit in which dung and urine from the milking shed are collected. The liquid draining through the manure heap collects in the underground tank from which it is pumped, and subsequently spread on the paddocks.

RAISING SOIL FERTILITY.

1. Appropriate Fertilizers.

Most Victorian soils are deficient in phosphorus and a top-dressing with a phosphatic manure is sufficient to effect a tremendous improvement in soil fertility. Numerous trials have demonstrated the outstanding advantage of superphosphate over all other phosphatic manures, and results from experimental plots of the Department of Agriculture in the Northeast indicate a progressive response to applications of superphosphate up to a 2-cwt. per acre dressing.

The natural rainfall and the prevailing economic conditions, however, determine the most suitable dressing to apply.

In the better rainfall country it should be profitable to apply up to a bag (approximately 187 lb.) per acre annually, but as the rainfall decreases dressings could be appropriately reduced with half a bag per acre or 112 lb. every second year as a minimum dressing.

There is a residual effect from using superphosphate, and this persists for a number of years. In a dry season when growth is restricted, one could reasonably assume that there is a greater residuum than in a normal year, and that in the next autumn it would not be necessary to use as much superphosphate as usual.

Because top-dressing with superphosphate encourages a vigorous growth of herbage, its use increases the drain on other substances in the soil. Those drawn upon in large amount are nitrogen, potash and lime, but in addition to these numerous others are required in smaller amount.

Experiments indicate that clover plants can provide an abundance of nitrogen by means of root nodule bacteria. These organisms can fix gaseous nitrogen which is subsequently made

TOTAL ANNUAL YIELDS IN CWT. OF GREENSTUFF/AC. 1939-40.

—	No Manure.	Super. ½ cwt. p. ac.	Super. 1 cwt. p. ac.	Super. 2 cwt. p. ac.	Super. 2 cwt. p. ac. + Potash 1 cwt. p. ac.	Super. 2 cwt. p. ac. + Potash 1 cwt. p. ac. + Lime 1 ton p. ac.	Super. 2 cwt. p. ac. + Lime 1 ton p. ac.	Super. 3 cwt. p. ac.	Average Annual Rainfall. (inches.)	1939 Annual Rainfall. (inches.)
Benalla ..	288	354	401	429	423	434	420	421	26·2	43·0
Wangaratta ..	253	341	408	477	486	484	468	501	25·3	45·6
Kiewa Valley (Kergunyah)	194	236	262	313	295	299	296	305	35·4	48·6

These manurial trials were established late in 1938. Autumn Dressings of super. and muriate of potash are applied each year. In the case of the 3 cwt. per acre dressing of super., 2 cwt. is applied in the autumn and 1 cwt. in the early spring. Only 1 dressing of lime has been applied. The rainfall in 1939 was abnormally high.

Waste is avoided by conserving surplus spring growth.

available in the soil in a combined form suitable for assimilation by plant roots.

In most cases, repeated applications of artificial nitrogen in the form of *sulphate of ammonia* restrict the development of leguminous plants and consequently lower the quality and productivity of the pasture.

The application of lime has not effected a marked improvement in total yield on the experimental plots at Benalla, Wangaratta, or Kergunyah, although in the early spring of 1939 the limed strips at Benalla and Wangaratta gave a slightly increased yield of subterranean clover. There was evidence that the palatability of the herbage at Benalla and Wangaratta was improved by lime, as stock grazed out the limed paddocks more readily than those receiving only superphosphate. It is suggested, however, that a trial strip of lime be laid down before deciding to purchase this material for top-dressing pastures. Lime cannot be regarded as a substitute for superphosphate under any conditions.

In the early part of 1939 when subterranean clover was making abnormally strong growth, the "superphosphate potash" treated strips at the Wangaratta plot yielded better than adjoining "superphosphate only" strips. Where potash has been applied to grazing paddocks on the same farm it stimulated the development of the subterranean clover and the stock showed a preference for the paddock.

As the area on which the grazing manurial trial is located had been subjected to continuous cropping some years previously, a potash response was not unexpected and had the area not been cropped it is unlikely that a response to potash would have become evident so soon.

The necessity for using potassic manures is largely governed by the type of management employed. On light soils in good rainfall areas repeated hay cutting will deplete soil potash reserves fairly rapidly and farmers are warned against this practice.

On the other hand, grazing animals retain only a very small amount of the potash they ingest, most of it being excreted in the urine. Land which is grazed, therefore, is much less likely to become deficient in potash than paddocks from which large quantities of hay are collected and fed to stock on other parts of the farm.

A recent development in the conservation of soil fertility is the construction at the milking shed of a manure pit in which the dung and urine are collected and subsequently spread out in the paddocks.

2. Top-Dressing Machinery.

Until recent years it was usual to apply fertilizer with a horse-drawn direct-drop spreader. Although this type of machine is capable of making a very uniform application, in many cases it has been found to be too slow and has been superseded by the broadcast spreader which throws out the manure by centrifugal action. Both types may be operated by horse or motor traction.

The general principle of the broadcast spreader is the same in all makes, but small variations exist mainly with regard to the method of feeding the manure on to the distributing plate,

The simplest method is a gravity feed from the hopper through a single spout, In some two spouts are used and it is claimed that this

[*Continued on page 220.*

Daily Distribution of Milk Essential

The Minister of Agriculture, Mr. Hogan, stated recently that the efforts of the Department of Agriculture and the Milk Board to ensure the freshness and good quality of Melbourne's milk supply would be wasted if milk were not distributed to consumers every morning.

A supply of fresh milk on Sunday is as essential as on any other day of the week. Bakers can bake a double supply of bread on Friday so that two days' supply of bread can be delivered on Saturday, but a double supply of milk cannot be produced on Friday for distribution on Saturday morning.

Allowing for seasonal fluctuations, cows produce the same quantity of milk every day, and they must be milked every day, including Saturday and Sunday. The milk is brought from the dairy farms to the city retailer every evening and distributed to the consumers the following morning. Even now, with a delivery every day, milk is a day old when the consumers receive it.

Seventy-five thousand gallons of milk is used daily in Melbourne. If it is not distributed on Sunday morning a double supply, 150,000 gallons, would be required for distribution on Saturday. There is no known way of making the cows that normally produce 75,000 gallons of milk each day increase their production to 150,000 gallons on Friday.

Referring to a statement by Mr. Turner, secretary of the Carters and Drivers' Union, Mr. Hogan pointed out that if Mr. Turner could tell dairy farmers how to double the production of milk on Fridays his propaganda might be more convincing. But natural laws prevent dairy farmers who have milk contracts from supplying a double quantity of fresh milk to retailers on Friday evening.

If the milk produced by the dairy cows on Saturday is not delivered to the consumers on Sunday morning, it would be distributed to consumers on Monday, Sunday's milk would be distributed to consumers on Tuesday, Monday's milk would be distributed on Wednesday, Tuesday's milk on Thursday, Wednesday's milk on Friday, and Thursday and Friday's milk on Saturday.

Consumers would have to use stale milk every day of the week, and not on one day only, if Sunday distribution were stopped, and, although Mr. Turner might not mind that, it would be a retrograde change. It would be injurious to the health of all the people, and disastrous to babies and children, as every mother knows. It would also be a breach of the Regulations of the Milk and Dairy Supervision Act which the Department would not allow.

Dr. Featonby, Chairman of the Health Commission, and Dr. Dale, Medical Officer of the City of Melbourne, have publicly warned the people against using stale milk.

Prevention of Tetanus

Tetanus or "lockjaw" is a disease caused by a germ that is often present in the soil in manure and in dirt. As this germ grows only when air is excluded, deep wounds, nail pricks, &c., should be opened to allow drainage, and thoroughly cleansed and disinfected with some suitable antiseptic.

Of domesticated animals, horses and sheep are the most susceptible to tetanus, and particular attention should be paid to stable hygiene and management and to disinfection during surgical operations. Sharp objects likely to cause wounds should be removed from stables and yards, and horses' hoofs should receive attention to prevent cracking. When marking lambs it is preferable to do so in fresh, temporary yards erected in the paddock. When a horse receives a wound which, because of its location readily becomes contaminated, or in which a foreign body has penetrated deeply, it should be injected without delay with a dose of veterinary tetanus antitoxin, the cost being small. Horses and other animals may be made immune from infection by the use of a vaccine—tetanus toxoid—and on farms where cases of tetanus have occurred, it is advisable to vaccinate all horses. A second injection, given twelve months after the first, will protect the horse for life. The cost is about 1s. 3d. for a dose of 10 c.c. required for a horse.

Some Diseases of Cabbages and Cauliflowers

By L. L. STUBBS, B.Agr.Sc., Assistant Plant Pathologist

IT is not intended that this article should cover the complete range of diseases affecting cabbages and cauliflowers. Rather it is an attempt to place before growers, a brief review of the existing knowledge of control methods as applied to several of the more important diseases.

Plant diseases may be either parasitic or non-parasitic in nature. Parasitic diseases are caused by fungi, bacteria or viruses, while non-parasitic diseases (in which no parasitic organizms are involved) result from unfavourable environmental conditions—either of soil or climate. Of the diseases described in this article, Blackleg and Clubroot are parasitic, while Whiptail is non-parasitic.

Blackleg.

(*Phoma lingam* (*Tode*) *Desm.*).

The parasitic fungus causing the disease known as Blackleg, affects cabbages, cauliflowers, brussels sprouts, turnips and other cruciferous crops. In New Zealand and Europe, a strain of the same organizm causes a serious dry-rot of swedes.

Symptoms of the Disease.—The earliest symptoms occur in the seed-bed in the form of spots on the leaves and stems of the young plants. Greyish-white lesions, roughly circular in outline, appear on the leaves. In these lesions numerous minute black dots which are the fruiting bodies (*pycnidia*) of the fungus develop. The slightly sunken lesions appearing on the stems usually have purplish borders and paler centres, and the fungal fruiting bodies develop in them in a similar manner. Badly infected seedlings may wilt and die, and under these conditions, the stem lesions may be confused with "wire-stem," but if the typical Blackleg leaf spots occur, it should not be difficult to distinguish between these two diseases.

Typical Blackleg lesions occur on the plants in all stages of development, (Fig. 1), but on older plants in the field, the stem frequently becomes girdled at or below ground level, in which case the lower part of the stem becomes dark-brown or black in colour, giving rise to the term "blackleg" as applied to the disease. The fibrous root system is largely destroyed, and this, together with the girdling of the stem, interferes with the water and food supply of the plant, while the leaf lesions disrupt the food-producing functions of the leaves.

Fig. 1.—Blackleg of Cabbage, showing blackening of main stem and lesions on leaves and seed pods. [*After* Walker, U.S. Dept. Agric.

Wilting, followed by death, may occur with older plants in the field, or others may linger on until the weight of the developing heads can no longer be supported by the decaying root-systems, and they also topple over and die.

When infection occurs at a later stage of development, the plant may be capable of producing seed, but the seed branches and pods show the presence of similar lesions. Seeds from badly affected pods may be shrivelled and not capable of germinating, while others may show no external evidence of infection and yet carry the dormant fungus in the seed-coat.

Causal Organism and Mode of Infection.—The causal organism (*Phoma lingam*) may carry over from one season to another in two ways:—

(1) The fungus remains viable on diseased leaves and stems remaining in the soil from a previous crop;

(2) In a dormant state inside the seed coat, or spores may adhere to the seed coat, or both.

The most serious infection occurs in the seed-bed either as a result of sowing infected seed or using infected soil. The earliest plants infected are usually killed and the fruiting bodies produced, liberate spores, which may be splashed from plant to plant by rain or as a result of overhead sprinkling. Moist conditions are necessary for the fruiting bodies to liberate spores, and for the spores to germinate and penetrate the host tissue.

If infected seedlings are planted in the field, infection may spread throughout the crop, particularly if moist conditions prevail.

Control.—Preventive control measures should be applied, because once infection becomes established there is no cure.

The following measures should always be practised:—

(1) The sowing of clean or disinfected seed. Particular care should be taken to obtain seed from healthy plants, and seed should not be sown unless its history is known.

(2) The use of clean soil for the seed-bed.

(3) A suitable rotation with non-cruciferous crops as the fungus may live in soil refuse for one or two years.

(4) Avoid overhead sprinkling of seed-beds—watering by furrow irrigation will prevent spores being splashed on to the foliage of healthy plants.

Seed Treatment should always be adopted as a preventive measure.

Mercuric Chloride Dip.—This treatment has been commonly recommended in the past. Seeds should be soaked for thirty minutes in a 1 in 1,000 solution (1 oz. to 6¼ galls.) of mercuric chloride, which will remove any danger of external infection, but does not always destroy the fungus if it is inside the seed coat.

Hot Water Treatment.—This method has not yet been tested by the Victorian Department of Agriculture, but is most frequently recommended in the United States of America (Walker, 1938). Seed held loosely in a cheese-cloth bag is immersed in water at a temperature of 122 degrees F. for fifteen to thirty minutes. Reduced germination, particularly of old seed (which is much more susceptible to hot-water treatment) may result, unless this treatment is applied with great care. A preliminary treatment with a hundred seeds or so is advised, followed by a germination test to determine the length of treatment the particular lot will stand without unduly reducing the germination rate. The water should be kept continuously agitated and the temperature maintained by the addition of hot water without applying it directly to the seed. This method is claimed to give complete disinfection, but it must be applied carefully, otherwise the seeds' power of germination may be destroyed.

Clubroot.

(*Plasmodiophora brassicae Wor.*)

This disease is caused by the Slime-mould (*Plasmodiophora brassicae*) which is capable

Fig. 2.—Cauliflower clubroot. Note spindle-shaped malformations on roots.

of infecting practically all cruciferous crops, including cauliflowers, cabbages, brussels sprouts, turnips and radishes, as well as cruciferous weeds such as Shepherd's Purse, Mustards, Charlock, &c.

Symptoms of the Disease.—The most characteristic symptom of Clubroot is, as the name implies, the abnormal spindle-shaped overgrowths which occur on the main and lateral roots, and also on the underground portions of the stem of an infected plant (Fig. 2). These malformations bring about a stunting of the plant due to interference with the normal functions of the roots.

If environmental conditions in the field become favourable for the rapid spread of the disease, plants may show signs of wilting during the hottest period of the day, which may be followed by permanent wilting. On the other hand, however, mildly-infected plants may develop medium-sized heads.

Fig. 3.—Cauliflower seedling showing early infection with clubroot.

Seed-bed infection is frequently not evident until the plants are pulled prior to transplanting, when the clubs are seen on the roots. (Fig. 3.)

Causal Organism and Mode of Infection.—The Slime-mould (*Plasmodiophora brassicae*), is capable of living in the soil in the absence of host plants for long periods. Fedorintchik, (1935), demonstrated the possibility of infection in soil not sown to crucifers for seven years, while Gibbs, (1939), in an extensive series of experiments proved that small losses could occur after six years, but few fungal spores could survive for more than five years in the absence of cruciferous crops.

Infection may occur either in the seed-bed or in the field, and spores may be transferred from infected soil to clean soil by human agency (implements, &c.), wind-blown soil, stable manure or compost originating from infected plants, irrigation water, and infected seedlings.

Moist conditions, heavy acid soils, and bad drainage, are favourable for the rapid development of the disease, whereas lime is an inhibiting factor.

Control.—Control measures are very difficult, and it is probably better to abandon the growing of cruciferous crops in infected soil for an indefinite period. If this is not possible, at least a four-year rotation should be practised between the growing of cruciferous crops.

Other control methods include—

(1) The liming of infected soil;
(2) Seed-bed treatment with corrosive sublimate.

Liming the Soil.—Heavy liming will definitely suppress the disease in time, but it is not always a practicable method, e.g., if potatoes are included in the rotation, high soil alkalinity will favour the development of Common Scab (*Actinomyces scabies*).

The amount of lime to apply depends upon the initial acidity of the soil, but a tentative recommendation is about one to two tons per acre of agricultural lime applied several months before planting the crop.

Overseas recommendations (Walker, 1938), include keeping the soil uniformly moist during the growing period of the crop. This would enable the lime to neutralize any acidity which develops normally around the roots of

growing plants (due to carbon dioxide given off by the rootlets), and which would enable the parasite to develop in this area.

Seed-bed Treatment.—A very dilute solution of mercuric chloride (*corrosive sublimate*) is watered over the seed-bed, and is claimed to give satisfactory control. The strength of the solution recommended varies according to the authorities. In England (Preston, 1934), experiments conducted on heavily-infected seed-beds showed that comparative freedom from the disease could be obtained by watering the seed-bed at the time of sowing the seed, and again when the plants were about two inches high, with 1 in 2,000 mercuric chloride (1 oz. in 12½ galls. of water). The solution was applied at the rate of one pint per five feet of row, where the seeds were sown in frames, and at double that rate in open seed beds.

In New Zealand, treatment of the seed-bed with a 1 in 1,000 acidulated solution of mercuric chloride is advised ten days before sowing the seed (Gibbs, 1935).

A concentrated solution, which will keep bottled up indefinitely, can be made by dissolving 1 lb. of mercuric chloride (powder) in 3 lb. of commercial concentrated hydrochloric acid. This solution is watered evenly over the bed (preferably through a rose) at the rate of 1⅝ fluid ounces per 4 gallons of water. The bed should be moist before treatment, and one gallon of water per square yard should be applied one hour after treatment.

As mercuric chloride interacts with metals, a wooden or earthenware container should be used. If this is not convenient, however, the solution can be mixed quickly in a kerosene tin and applied immediately.

Whiptail.

Whiptail or malnutrition of cauliflowers is exceedingly prevalent on acid soils in Victoria. It has been demonstrated that Whiptail is a physiological disorder in which no parasitic organism is involved (Clayton, 1924; Magee, 1933), and the conditions under which the "disease" develops are known, although the real cause is yet unknown.

Symptoms of the Disease.—The symptoms of whiptail are very characteristic, the affected plants appearing straggly and undernourished when seen growing alongside normal cauliflowers (Fig. 4). The leaves of affected plants are narrow, excessively crinkled, thicker than normal, and brittle. Frequently the lateral roots are reduced both in number and in length. The outer lower leaves are generally the most severely affected (Fig. 5).

Lightly affected plants may develop heads, but they are usually small and unmarketable.

Fig. 4.—Crop of Cauliflowers badly affected with whiptail.

Conditions Favouring Whiptail.—Under Victorian conditions, analyses of soils on which Whiptail has developed has always revealed a high acidity.

In the United States, the occurrence of Whiptail has also been attributed to heavy manuring with artificial fertilizers (Clayton, 1924).

In England a condition resembling Whiptail it is claimed, has developed on soils naturally high in lime (Ogilvie and Hickman, 1936).

Control.—Experiments conducted in New South Wales (Magee, 1933), proved effectively the value of heavy dressings of lime to combat the "disease." The amount of lime to apply varies according to the initial acidity of the soil, but it is tentatively suggested at 1½ to 2 tons of agricultural lime per acre.

It has been the experience of the Victorian Department of Agriculture also that lime will successfully control the disease.

The appearance of Whiptail in isolated patches of an otherwise healthy crop may appear confusing at first sight, but analyses for soil reaction have demonstrated that highly acid "patches" may occur in a field, and on these areas Whiptail will develop.

Fig. 5.—Cauliflowers affected with whiptail, showing narrow crinkled leaf laminae.

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The Pre-harvest "Drop" of Fruit

Reduction by Spraying

By

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"Growth substances" have been found in other fruitgrowing countries to reduce the pre-harvest "drop" of fruits, particularly apples. Two of these substances have been tested on Jonathan apples in Victoria and found to be effective and profitable. A spray of 5 parts per million of a-naphthalene acetic acid or naphthalene acetamide applied 12-14 days before picking and directed particularly at the fruit stalks is recommended. White oil, 1 pint in 100 gallons, as a spreader is beneficial. Growers are warned against leaving fruit intended for storage on the trees later than the normal picking time.

FRUITGROWERS will welcome a simple and effective means of reducing the excessive dropping of many varieties of fruits just before picking time. Many thousands of cases of fruit are lost every year because of this pre-harvest "drop," and sometimes the losses are disastrous. Once the fruit has fallen it is practically worthless, and hardly warrants the cost of picking up unless the ground has been previously strawed.

Although losses sometimes occur many weeks before the fruit is ready to pick, they are usually most serious within two or three weeks of maturity. Probably the most disheartening experience for any orchardist is to see his almost-ripe fruit, perhaps Jonathan or Delicious apples, left on the tree a day or two longer to develop a little extra colour, dropping rapidly from the trees, and to be helpless to prevent it.

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Windfall fruit rejected from an orchard.

This no longer will be the case, however, if the orchardist adopts the preventive measures outlined in this article.

Causes of Dropping.

Causes of dropping are many, but the chief are climatic. Heat waves in late February or early March, especially when followed by cold nights, frequently cause an excessive fall of fruit. Winds and storms about New Year time may cause a disastrous loss of canning pears in the Goulburn Valley and later storms may tear almost mature apples from the trees. In the 1940 and 1941 seasons such climatic factors have been major causes of fruit dropping in Victoria.

Other factors entering into the "drop" problem are codling moth and woolly aphis infestations. Codling affected fruits are more likely to drop than sound ones. Of course, they do not cause a financial loss to the grower in so doing, having been made worthless by the grub already, but the apples which drop because the tree or limb is heavily infested with woolly aphis do represent a direct loss.

Trees which are growing vigorously because of youth, a rich soil, or heavy dressings of nitrogenous fertilizers are apt to drop more fruit than less vigorous trees, particularly when they have a heavy crop. Dry soil conditions in late summer, too, will loosen the fruit on the trees, and make it likely to fall.

Any or all of these factors may operate in the one season, so that the "drop" varies widely from year to year. For instance, in Jonathan apples there appears to be a minimum loss of 10 per cent. of the crop during the pre-harvest period, even in the most favorable seasons, while in some seasons, as in the autumn of 1940, this figure may rise to 50 per cent. or more.

In other fruit-growing countries the use of plant hormone sprays has been found to be extremely effective in reducing this pre-harvest drop of fruit. These hormones, or "growth substances," are used commercially in horticulture in many ways, chiefly to help root production in the propagation of plants by cuttings. It was observed that leaf stalks on cuttings sprayed with these hormones remained attached and green for longer periods than on untreated cuttings, and that the abscission or falling of flower parts was delayed. Such discoveries led to the idea of preventing fruit "drop" by spraying bearing trees with these substances, and the results obtained fulfilled the most optimistic expectations. Two substances, a-naphthalene acetic acid and naphthalene acetamide, which are produced synthetically, were found to be the most effective sprays. It was considered necessary to test these sprays under Victorian conditions, and check up on the concentration, and the time and method of application recommended overseas. An a-naphthalene acetic acid preparation available on the Victorian market was used for the main tests, and a later trial was made with an American preparation containing naphthalene acetamide.

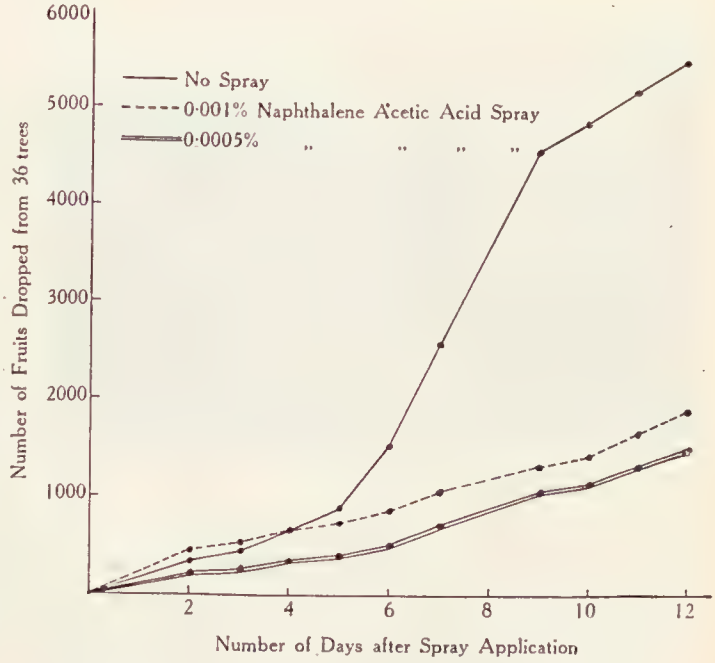
Experiments in Victoria.

The first small scale test was carried out in the autumn of 1940 on Jonathan apples, and as a result of the encouraging results obtained a full scale field experiment was undertaken this season at the orchard of Mr. D. Lipscombe, Croydon. The experiment was combined with an already existing fertilizer trial on Jonathan apples so that full information could be obtained on the effects of spray and fertilizer on the dropping of apples. One-third of the plots were sprayed with a solution of a-naphthalene acetic acid 10 parts per million (i.e., 0·001 per cent.) and one-third with a 5 parts per million (i.e., 0·0005 per cent.). The remainder of the plots were left unsprayed. One pint of white

oil emulsion was added to every 100 gallons of spray to act as a spreader and to aid the penetration of the hormone.

The usual recommendation is to apply the spray as soon as there are any signs of the commencement of a major drop. It was arranged in this case that if no such signs were observed within twelve days of the proposed time of picking the sprays would be applied forthwith. This was actually the case, and the sprays were applied on 28th February. The spray outfit worked at a pressure of 350 lb. per square inch using two rods with double nozzles. The spray was directed more downwards than upwards to obtain a more efficient wetting of the fruit stem. Hot, windy conditions prevailed at the time.

After spraying, the ground under each tree was cleared of old windfalls, and records were taken each day of newly fallen fruit. Two days after spraying, the effectiveness of the spray was apparent. A small drop occurred each day, but on the sixth and eighth days after spraying severe wind storms were experienced, under the stress of which the unsprayed trees lost a good deal of fruit, while the sprayed trees lost very little. The number of fruits lost from each group of 36 trees is shown in the accompanying graph. The first picking of fruit from the experimental trees was made twelve days after spraying, the remainder being picked twenty days later.



Summation curves of fruits dropped after spraying.

The average amount of fruit carried by each tree at the time of the spray application was 157 lb., i.e., approximately 4 bushels. In the accompanying table, the "drop" from 36 trees over the ten-day period from two days after spraying till the first picking is shown in pounds, and as a percentage by weight of the average crop of fruit carried at the time of spraying.

The difference in fruit dropped between either spray treatment and no treatment is highly significant, but the difference between the two concentrations of hormone is not statistically significant, which means that 0.0005 per cent. (5 parts per million) is a sufficient concentration.

Making allowance for an observed 8 per cent. codling moth infection, the reduction, due to either concentration, in the fruit lost was therefore 22 lb. per tree, which is equivalent to 70 bushels per acre on an 18 ft. x 18 ft. planting. It should be emphasized that the 1941 "drop" in the metropolitan districts was quite normal. Had it been excessive as that which caused the loss of 50 per cent. of the crop in many orchards in 1940, it seems certain that a much larger quality of fruit would have been saved by the spray.

Treatment.	Fruit Drop from 36 trees over 10-day Period before Harvest.	
	In Lb.	As Percentage of Average Total Crop at Spraying Time.
.001 per cent. a-naphthalene acetic acid	266	4·7
.0005 per cent. a-naphthalene acetic acid	250	4·4
Unsprayed	1,120	19·8

S.E. of mean of six 6-tree plots = 19·4 lb.

With a normal average price of 4s. per bushel for Jonathans, the fruit saved would be valued at 2s. 2d. per tree, which is equivalent

to £14 per acre. The following table gives the actual costs of spray materials and labour on both a tree and an acre basis.

Item.	Costs.	
	Per Tree.	Per Acre.
A-naphthalene acetic acid preparation (.0005 per cent. Concentration)*	0 10*	5 8 0*
Labour	0 3	1 12 0
Total ..	1 1	7 0 0

* The manufacturers of the preparation which was used in this trial advise that they could supply the a-naphthalene acetic acid in another form just as suitable for this purpose at a much lower rate.

It is evident that even this year when the dropping of Jonathans was only moderately serious, when average prices do not exceed 3s. 6d. per bushel, and when the cost of the spray material was higher than it is likely to be in the future, application of the spray was well worth while. Further, the experiment showed that a concentration of 0.0005 per cent. is sufficient and that the methods used in timing and applying the spray were effective. The effects of fertilizers on drop were not significant.

A small scale trial with the naphthalene acetamide preparation showed that it is effective also in reducing drop. However, the quantity available was so small that although its effect was proved significant, there was not enough information to allow its effectiveness to be compared with that of the a-naphthalene acetic acid. A trial on a still smaller scale was carried out on W.B.C. pears in the Goulburn Valley using the 0.001 per cent. a-naphthalene acetic acid spray. The results were variable and inconclusive, and a more comprehensive trial is contemplated for next year. Trials with other fruits such as grapefruit, lemons, and peaches are also proceeding, but are not concerned with the pre-harvest drop.

Practical Considerations in the Use of the Spray.

There are certain practical considerations not to be overlooked with respect to the time and method of application of the spray, duration of the effect of the spray, and the place of such a pre-harvest spray in the orchard routine.

In Victoria, the spray cannot be timed with any degree of success by the method generally recommended—i.e., spraying as soon as signs of a major drop appear. Most such "drops" in Victoria are sudden of onset and brief of duration, and the damage may be done during the two days which the spray requires to become effective. The more practical method is to fix the spraying date a certain number of days before the picking date, the exact number of days depending on the duration of the effects of the spray on the particular variety concerned. This has been shown to vary from eight days to three weeks, and in the above experiment with Jonathans, the effects seemed to be wearing off just at picking time, twelve days after the spray applications. While definite local information on other Victorian varieties is not yet available, it is probable that the best time to apply the spray is from twelve to fourteen days before picking. A spray so late in the season will present some difficulty to growers who do not possess a stationary spray plant and whose trees are so laden that their branches interfere with the use of the spray cart, but it should be no more troublesome than a late codling moth spray. Indeed, with some varieties, the cost of the hormone spray can be reduced by mixing it with the last white oil or lead arsenate spray, there being no unfavorable reaction between them.

Stacks of baled straw for mulching an orchard to catch windfalls.

The method of spraying is controlled by the way in which the hormone acts. The dropping of a fruit results from the weakening of the stem just where it normally breaks when the fruit is picked. This weakening is apparently due to the tree being unable to maintain the supply of the hormone which has, up to that time kept the stalk strong. If the tree is sprayed with a synthetic hormone of the same type, which can be absorbed readily by the fruit and foliage, weakening is prevented, or even remedied, and the fruit is better able to withstand influences which tend to make it fall from the tree. By directing the spray particularly at the stalk of the fruit, a better and quicker tightening effect is obtained than if the fruit be sprayed at the calyx end or if the foliage alone is sprayed. This means that better results will be obtained by spraying more downwards than upwards as contrasted with the codling moth method of spraying more upwards into the calyx. The amount of spray required is greater with the "drop" spray than with the codling spray because of the difficulty in hitting the fruit stalks. For example, a tree requiring 2½ gallons for a codling moth spray will take 3 gallons of the "drop" spray.

Heavily laden Delicious apple trees strawed to catch windfall fruits.

Insurance Value of the Spray.

Each grower must decide for himself whether a spray for the prevention of "drop" has a place in his routine. He is the only one who knows how regular and how great is his loss in fallen fruit each year and whether his crop in any year is large enough to warrant this protection. The spray must be regarded as an annual insurance measure for susceptible varieties in orchards which are prone to considerable loss and where the fruit saved will at least pay for the cost of application every year, and pay handsome dividends in many seasons. Looking at the spray in this light, and having regard to its cost, more than one application to any set of trees in one season cannot be recommended, except under unusual circumstances. In trees which are not stripped in one picking, there is normally not sufficient fruit left to justify a second spray, and in addition the remaining fruit becomes less likely to fall after the first picking.

In conclusion, a word of warning is given to growers who might use the hormone spray to allow the picking of certain apple varieties, such as Delicious, to be delayed until they develop better colour. While the spray will hold the fruit on the tree a fortnight or so longer, there is no evidence to suggest that it will delay the ripening of the fruit, so that the fruit may, while colouring, become mature. This maturity, of course, is a secondary consideration to colour when the fruit is to be marketed immediately, but it is a grave disadvantage when the fruit is to be stored. It is still important, therefore, that fruit intended for storage be picked at the correct maturity, and not simply left on the tree until its general colour is satisfactory.

Acknowledgment.

The materials used in the foregoing experiment were made available through the courtesy of the Technical Department of Imperial Chemical Industries of Australia and New Zealand Limited.

Burnley Egg-Laying Competition

New Twelve Months' Records Established

By H. F. CLINTON, Poultry Expert

This team of Australorps entered by the late J. J. Herbert established a new Burnley record for all breeds (team of six birds) for the full twelve months, with a total of 1812 first-grade eggs.

IN the picturesque surroundings of the Burnley horticultural gardens the first Burnley Egg-laying Competition commenced in 1911. Since that time a large number of prominent poultry keepers, possessing many years of experience in breeding for high egg production, have been from year to year busily engaged in improving the egg-laying qualities of their stock for the purpose of exceeding the previous twelve months' Burnley record. As a result of the great enthusiasm among breeders in this regard, record after record continued to be broken. In the 1923-24 competition, a new twelve months' record was established for a single bird of any breed, a Black Orpington (now Australorp), owned by Mr. W. Cullen, having laid 338 eggs (last egg weighed 2 7/16ths oz.). Four years later, in the 1927-28 competition, another twelve months' record was established for all breeds by a team of six Black Orpingtons (now Australorps) entered by the Wingood Poultry Yard. This team laid 1,723 eggs (110 of which were under first grade).

These records, established so many years after the competition was first commenced, were considered to be very high, and, therefore, it is not surprising that they remained unbeaten for a further long period of years.

Since 1926-27 the Burnley competitions have been conducted for 48 weeks, but if a team of six birds, or a single bird is likely to break the previous record they are retained for a full twelve months (365 days). Every individual egg is weighed at Burnley, and only first-grade eggs are counted for the purpose of awarding the prize. For the first two months of the competition a first-grade egg must weigh not less than $1\frac{3}{4}$ oz., and thereafter during the remainder of the competition not less than 2 oz.

In the 1938-39 competition the late J. J. Herbert's team of six Australorps exceeded the previous twelve months' record of 1,723 eggs, established by the Wingood Poultry Yard in 1927-28, by laying 1,734 first-grade eggs.

In the 1939-40 competition Mr. Herbert entered another team of six Australorps, which again exceeded the record established by his birds in the previous competition by laying 1,788 first-grade eggs in twelve months.

In the competition recently concluded (48 weeks, ended 2nd March, 1941), particulars of

which were published in the April issue of this *Journal*, Mr. Herbert entered another team of six Australorps, which was retained for the full twelve months, ended 31st March, 1941. At the end of this period these birds again exceeded the twelve months' record for all breeds, established by Mr. Herbert's team the previous year, by laying 1,812 first-grade eggs. Thus, for the third year in succession, this owner's Australorps exceeded the previous record. The record established this year is the highest twelve months' Burnley record for a team of six birds of any breed.

In the 1940-41 competition recently concluded, Mr. F. W. Becker's single bird, an Australorp, also was retained for the full twelve months. This bird went on to lay 340 first-grade eggs, establishing a new twelve months' Burnley record for a single bird of any breed, and laying two first-grade eggs more than were laid by Mr. W. Cullen's Black Orpington in 1923-24.

Mr. Becker also entered a team of six White Leghorns in this year's competition, and these birds were retained for twelve months, ended 31st March, 1941. During this period they laid 1,767 first-grade eggs, the highest number to be laid at Burnley in twelve months by a team of six White Leghorns.

In the particulars of the twelve months' results given overleaf it will be seen that, out of a total of thirteen birds retained for that period, seven birds laid over 300 eggs each. The average number of first-grade eggs laid per bird in Mr. Herbert's team was 302, and in Mr. Becker's team 294·5 first-grade eggs per bird.

Mr. F. W. Becker's Australorp, which, for the full twelve months' period, laid a total of 340 first-grade eggs, exceeding by two eggs the previous Burnley record of 338 eggs for a single bird of any breed.

Mr. F. W. Becker's team of six White Leghorns which, in the full twelve months' period, laid 1767 first-grade eggs, exceeding the previous Burnley record for White Leghorns.

The number of under-weight eggs laid by the thirteen birds was nine, which is remarkably small considering the large number of eggs laid.

It is interesting to note that one of the record-breaking birds laid eggs equivalent to 8½ times her own weight.

DETAILS OF TWELVE MONTHS' RECORDS (365 DAYS), ENDED 31st MARCH, 1941.

SECTION A.—TEAMS OF SIX BIRDS—TRAP-NESTED.

Class 4.—Australorps—Wet Mash.

Pen No.	Name and Address.	Bird No.	Total Eggs.	Under-weight.	First-Grade Eggs.	Weight of Birds at 31.3.41
						lb. oz.
55	J. J. Herbert (deceased), 13 Dunn-street, Wonthaggi	325	308	..	308	4 11
		326	261	2	259	5 8
		327	324	1	323	5 2
		328	290	..	290	4 8
		329	321	..	321	5 2
		330	311	..	311	6 8
	Totals ..	..	1,815	3	1,812	..

Section A.—*continued.*

Class 1.—White Leghorns—Wet Mash.

Pen No.	Name and Address.	Bird No.	Total Eggs.	Under-weight.	First-Grade Eggs.	Weight of Birds at 31.3.41
						lb. oz.
6	F. W. Becker, Follett-road, Cheltenham, S.22	31	289	..	289	6 2
		32	313	..	313	4 15
		33	312	..	312	5 4
		34	285	..	285	4 11
		35	281	..	281	5 1
		36	287	..	287	4 9
	Totals ..	..	1,767	..	1,767	..

SECTION B.—INDIVIDUAL BIRDS—SINGLE TEST.

Class 4.—Australorps—Wet Mash.

Pen No.	Name and Address.	Bird No.	Total Eggs.	Under-weight.	First-Grade Eggs.	Weight of Birds at 31.3.41
						lb. oz.
102	F. W. Becker, Follett-road, Cheltenham, S.22	102	346	6	340	6 2

PASTURE IMPROVEMENT—*Continued from page 206.*

gives a uniform spread on both sides of the machine. A further modification is the use of two distributing plates.

Some machines feed the manure by means of a spiral which is either at the bottom of the manure hopper or beneath and free of the weight of the manure which it is said reduces the friction and, therefore, the draught of the machine.

Hoppers are either cone shaped and open at the top or box shaped with a lid. A small seed receptacle which can be hung on the inside of the cone type of hopper and be adjusted to feed in seed at a fairly uniform rate is obtainable.

The part of the broadcast spreader requiring most lubrication is the rotating spindle carrying the distributing plate, and in some cases the drive and bearings are running in an oil bath. In the other cases they are lubricated by grease cups only.

Broadcast spreaders without wheels are available for attaching to a dray or motor truck, or can be procured mounted on wheels and can be fitted with pneumatic tyres if necessary. A special hillside model with flanged steel wheels on a wide axle and a low slung chassis is available from some manufacturers.

A liquid manure spreader can be made easily by fitting to the back of a "Furphy Tank" a narrow trough with holes in the bottom, or an overflow board. An alternative is to use a "T" shaped pipe having numerous holes.

A Furphy tank fitted with a "T" pipe for spreading liquid manure.

Fodder Conservation.

A feature of improved pastures is the tremendous flush of growth which they produce in the spring. Despite heavier stocking it is impossible for the animals to keep down this rapid growth, but waste may be avoided by conserving the surplus in the form of silage or hay.

In the early spring when conditions are not favourable for hay-making, paddocks could be mown for silage, but later when the weather becomes more settled hay-making is a cheaper method as it involves less labour per ton of dry matter. Many farmers are finding that pressing hay has many advantages which more than repay the extra costs involved.

Whichever method of conservation is practised, paddocks should be mown in rotation to avoid imposing a heavy drain on soil mineral in any one area.

Live Stock Notes

Reminders for May—June

Compiled by A. C. T. HEWITT, M.Agr.Sc., Live Stock Science Officer

Farm Animals.

MANY farmers engaged in livestock production will remember the visit to Australia some three years ago of Dr. John Hammond, the world authority on animal breeding and physiology. Already much of the information imparted by Dr. Hammond has been used by Australian farmers, while considerable thought has been given to other questions raised by him.

Dr. Hammond recently has had published a book entitled Farm Animals. It is a brief, easily understood summary of the results of work done and knowledge accumulated by the author on breeding, reproduction, growth, development, and inheritance. The latest knowledge on the breeding cycle of horses, cattle, sheep, pigs, and poultry is explained. The reproduction process, including fertility and artificial insemination, the growth and development of the foetus and the young animal, and the subsequent production of work, milk, meat, wool, eggs, &c., are explained. Throughout the book, Dr. Hammond draws attention to the effects of environment on animal growth production and reproduction. In this connexion, the following paragraphs, which are taken direct from the book, may be of interest:—

"The development of all economic characters is dependent on the environment in which the animal is reared and kept. As the environment (food supply, &c.) determines the degree to which the character (milk yield, meat conformation, &c.) is developed by the animal, selection for such characters can be made only under conditions which are such as to develop properly the character in question.

"The conformation of an animal may be shaped by the food supply under which it is reared. As an animal grows up it changes its shape, or conformation, or composition. This is brought about by the different parts and

tissues of the body growing at different rates. Some parts and tissues—such as the head and bones—develop early in life, while others—such as the loin and fat—develop later. The early developing parts and tissues of the body have priority of nutrition over the later growing parts and tissues, so that when the level of nutrition is low it is the later developing parts (such as the loin and the fat) which suffer most. Thus it is not possible to make proper selection of animals for a high proportion of loin or fat under conditions where food supply is limited, for the development of these parts and tissues will be limited, not by the genetic capabilities of the animal but by the environmental food supply.

"This applies in the same way to milk production. Food intake is used for the maintenance of the body first, and only the surplus is used for production; consequently, where food supplies are limited the genetic capabilities of the animal for milk production are not shown up and proper selection cannot be made.

"When we wish to direct the improvement of an animal in any respect we should, therefore, place it in an environment which allows full expression of the character in question and rigorously select and breed from those individuals which show the character to fullest extent.

"In India, where cattle are numerous and food for them scarce, very little improvement was effected in breeding for milk production until certain Agricultural Colleges, such as those at Lyallpur, Karnal, Pusa, &c., began to establish herds, manage the cows well, and feed a proper balanced milk-producing ration. By selecting those animals which showed the capability of producing more milk under these conditions and by breeding their progeny together, yields have been rapidly increased and the breeds improved for milk production. Thus at Pusa, while the average daily yield in the first year was 5.8 lb. and by the sixth year only 6.1 lb., by the 13th year it had risen to 12.3 lb., and by the 20th year to 18.5 lb.

"Other examples of this improvement by selection in a suitable environment are the increase from 3.4 per cent. to 3.9 per cent. butterfat in the milk from 1900 to 1933, and the increase from 6,800 lb. to 8,200 lb. of milk per cow per year in Denmark. Incidentally the effect of limited food supplies to the cows during war-time (1914-18) is very marked for milk yield, and one can realize how, under these conditions, it would not be possible to make selection of the high yielding cows, because it is the food and not the genetic capabilities which are now limiting the yields. Not only food supplies, but also age, dry period before calving, &c., affect the yield of milk given by a cow, and attempts have been made to draw up tables for correcting yield for these factors, so as to obtain a better comparison between individuals differing in these respects."

[Reference :—J. Hammond, Farm Animals, Edward Arnold and Co., 1940.]

Dairy Cattle.

At the present time more dairy cows are dry than at any other period of the year. The fact that the animals are not producing milk, however, should not be taken as an excuse for reducing their ration. The unwisdom of this practice is now appreciated generally by progressive dairy farmers. Good yields in the year following are not to be expected if dry cows are inadequately fed during their pre-calving period.

The amount of growth and development of the secretory tissue of the udder during the latter part of pregnancy—that is, while the cow is dry and springing—determines the amount of milk it is possible for her to give after calving. If the cow is not fed adequately during this period, insufficient secretory tissue is formed. By fattening the dry cow, fat is formed in the udder and takes the place of secretory tissue. Dairy farmers, therefore, will be well repaid by feeding milk producing rations containing plenty of protein, to dry, pregnant and springing cows.

Good green pasture provides ample and sufficient feed for the dry cow, but, as most pastures are scant at this time of year, dry cows should be given a supplement of good quality clover, lucerne hay, or silage. Where only medium and poor quality hay or silage are available some concentrate should be fed, when, in addition to sufficient hay and silage, at least 3½ lb. of one of the following mixtures should be fed to each dry cow per day—a mixture of 5 parts of pollard or ground grain and 1 part of meat meal, or a mixture of 3 parts of pollard or ground grain and 1 part of peanut meal, or a mixture of 3 parts of pollard or ground grain and 2 parts of linseed meal.

Horses.

Treatment of Itchy Legs.

A complaint known as "Itchy Legs" is very prevalent among horses, especially the heavier breeds, and information regarding this trouble is constantly being sought. It is caused by a small parasite—the mange mite (*Chorioptes equi*)—living on the skin and the lower portions of the legs. Infected horses paw, kick, and rub their legs against fences, stable walls, &c., and often bite the affected parts.

Eradication is comparatively easy by clipping the legs and applying dressings of kerosene emulsion, made by dissolving 1 lb. of soft soap in 1 gallon of hot water, and stirring in 1 pint of kerosene as it cools. The emulsion is then thoroughly worked into the skin, or the affected limb may be immersed in a bucket of the emulsion. Another useful preparation for the trouble can be made by thoroughly mixing 1 oz. of nicotine sulphate in 1 gallon of soapy water. The lotion is then scrubbed into the affected limbs with a stiff brush and allowed to dry in the sun. This treatment should be repeated in two weeks.

Where a number of horses are to be treated, however, it will be found necessary to use a dip, or foot bath, as is done with sheep.

In many centres in Australia, public horse dips have been constructed, and are much used for the treatment of horses suffering from irritation by external parasites on the legs. Many owners also have erected horse dips on their own properties.

Diagrams and full instructions for building a horse dip may be obtained on application to the Superintendent of Live Stock, Department of Agriculture, Melbourne, C.2.

A very useful dipping lotion can be prepared on the farm by using the following formula:—

Lime	11 lb.
Sulphur	22 lb.
Water	100 gal.

The preparation of this bath may involve practical difficulties because the ingredients require to be boiled in the water, of which a large volume is necessary. However, if preferred, any of the approved dips will give good results.

The red mite (*Dermanyssus gallinae*) so common in poultry is often found on horses, especially when fowls are allowed to roost in stables. The mites drop on the horses at night. Remove the poultry from the stables, and treat by applying any of the dressings just mentioned.

To properly control these parasitic infections it is essential that the stables, rubbing posts, &c., be thoroughly disinfected, otherwise the horses will become re-infested from the mites hiding in the cracks. All these hiding places, firstly, should be thoroughly scoured with boiling water containing 5 per cent. of lysol or other approved disinfectant, and then sprayed or painted with an insecticide such as crude oil; a mixture of crude oil and kerosene; nicotine sulphate solution; tar oil or a recognized sheep dip. If a spray is used it should be forced into all cracks and crevices.

[W. D. Shew, G.M.V.C., B.V.Sc., Senior Veterinary Officer.]

Pigs.

The present is a suitable time to inspect the shelter sheds on the piggery and put them in good order before the winter.

Pigs kept in pens or paddocks require a warm, dry, draught-free shelter, properly protected from the extremes of climate. Many newly-born pigs die through exposure to cold. In sheds with cracks or spaces in the floors or the lower parts of the walls pigs are subject to pleurisy.

Warmth in the animal body is produced by food and conserved by external protection. If the latter is deficient, more food is required to keep the animal warm. Thus in pigs the economy of food conversion into pork is reduced when pigs have not a warm, dry shelter in cold weather.

In very cold weather, pigs huddle into sheds to keep warm. It is necessary, therefore, to have pigs in relatively small lots to avoid excessive crowding with its attendant evils of bad ventilation and over-heating.

[L. A. Downey, H.D.A., Pig Expert.]

Sheep.

The Sixty-Third Annual Show of the Australian Sheep Breeders' Association will be held from the 28th to 30th July, 1941. The Royal Agricultural Society of Victoria and the Australian Society of Breeders of British Sheep have again donated substantially to the general prize funds of the show. In addition, many

individual members of the Association have increased their usual contributions to the prize schedule.

Innovations this year are classes for fleeces which, it is hoped, wool growers and breeders will fully support. Any fleeces forwarded for competition in these classes must be shown in one piece. They must not be skirted, and the belly wool must on no account be torn from the fleece during shearing, otherwise the fleeces will not be eligible for entry.

The junior judging competitions will be conducted as usual in the Merino sections of the schedule.

An alteration to the regulations in the grass-fed sections provides that sheep may be housed for 31 days before the date of commencement of the show. Entries close with the Secretary, Australian Sheep Breeders' Association, 422 Collins-street, Melbourne, on the 3rd July, 1941.

[N. A. Bowman, Sheep and Wool Expert.]

Poultry.

During the autumn season eggs reach their highest values, therefore, every effort should be made to keep the birds in good health and maintain a high egg production.

Spring is the period of highest egg production, and the great strain imposed on the birds during this season will be borne more readily if they are kept in good physical condition during the winter.

The pens should be cleaned out before the cold weather sets in, and provided with plenty of fresh litter for warmth and comfort. The litter always should be kept clean and dry.

All draughts must be prevented, but adequate ventilation is necessary. Fresh air and clean dry conditions are required for good health and high egg production. These conditions apply particularly while the birds are on the perches at night.

Dry floors help to keep the eggs clean.

[H. F. Clinton, Poultry Expert.]

Bees.

The honey gathering season is almost ended, and all supers should be removed and the hives made snug for the winter. The early closing down of the hives enables the bees to pack their brood combs more fully with honey. This assists in conserving warmth. To produce heat to counteract avoidable falls in temperature within the hives, bees consume more honey. Consequently a colony continually delving into its winter stores of feed to develop extra heat will require a greater amount of honey to carry it through the winter than a colony confined to a small comfortable weather-proof space, where the normal consumption of food for maintenance is sufficient.

There are indications of some grey-box blooming through the winter. Honey gathered during the winter is often the cause of mortality among bees. Such honey may ferment instead of ripening, and fermented honey is eaten with fatal results. Ripening is largely the evaporation of surplus moisture from the honey, and when the hives are closed down early and kept warm the honey is more likely to ripen properly.

Good prices are usually obtained for honey from late autumn until early spring. Apiarists with stocks on hand should not try to force too much on to the late autumn market, but gradually release it so that they offer a steady supply and obtain a satisfactory price.

[J. S. Eagland and J. W. Thomlinson, Apiary Inspectors.]

List of Stock Foods and Stock Licks

A list of stock foods and stock licks for 1941 (registered under the *Stock Foods Act* 1936) and published in the *Victoria Government Gazette* may be obtained free on application to the Chemist, State Laboratories, Gisborne-street, Melbourne, C.2.

Actinomycosis

"Lumpy Jaw" or "Woody Tongue"

By S. A. MOUNTJOY, L.V.Sc., Veterinary Officer

Actinomycosis of Throat Glands.

ACTINOMYCOSIS is an infectious stock disease, and every year in Victoria it is necessary to kill a large number of cattle suffering from it. Actinomycosis is one of the diseases specified in the Cattle Compensation Act, which provides for the payment of compensation on account of cattle suffering from certain diseases which are destroyed. Now and again pigs, horses, and sheep contract the disease, and human beings are not immune.

Cause.

The disease is caused by an organism known as the Ray Fungus, which exists in grasses and grain. It is strongly resistant to antiseptics, heat, and sunlight, and may remain alive in a dry state for years.

Mode of Infection.

When animals eat food containing the fungus, infection takes place through the mucous membrane, usually of the mouth. A possible point of entry is in the wound left by the shedding of temporary teeth, or infection may be caused by grass seeds, particularly the seeds of barley-grass and spear-grass; such seeds, when eaten dry, force their way through the mucous membrane of the tongue, mouth, or pharynx, and carry the infection into the deeper structures. For this reason the disease usually is more prevalent in districts where such grasses as those referred to abound. Infection of the udder occurs through the milk ducts.

Symptoms in Cattle.

The parts most frequently affected are the skin and glands of the head, throat, jaws, tongue, and udder. In actinomycosis of the lips there are to be found in the connective tissue of one or of both lips round or ovoid firm tumors, varying in size from that of a pea to that of a walnut. These tumors usually undergo softening in the centre, and may break externally. In some cases there may be a large amount of connective tissue in the region of the nodules, causing the lips to be quite firm and rigid.

Actinomycosis of the tongue, which may be suspected if salivation is noticed, often takes the form of firm nodules on the organ, or of an ulcer in the so-called food cavity. Later on, when the muscular tissue becomes affected to any great extent, the tongue will be forced out of the mouth and mastication will be interfered with; inspection will reveal the presence of nodules or ulcers. In more advanced cases the organ is much enlarged, and almost wood-like to the touch, hence the name "Woody Tongue."

Actinomycosis of the jaw bones is, as a rule, not noticed until the head shows more or less deformity. On either the upper or lower jaw bones a firm hard swelling develops, due to an increase in the size of the bone. The swelling, which generally causes difficulty in chewing, spreads and increases in size, the overlying skin becomes thickened and adherent to it, and eventually perforation takes place with the discharge of thick yellow pus. Granulations gather around the wound, very often forming a large cauliflower-like mass of raw tissue which bleeds easily.

Actinomycosis of the skin and glands of the head and throat is usually first noticed as a

small insensitive and somewhat large swelling, from which a cord-like thickening extends into the depths of the tissues, situated behind the angle of the lower jaw, below the ear, on the cheek, or on the neck. This swelling gradually enlarges, becomes firmly united to the overlying skin, which it usually perforates, and discharges a thick creamy pus or pus-like mass.

The wound will very often heal, but later on another swelling will probably form in the vicinity, eventually discharging pus. In some cases the wound does not heal, and discharges slightly most of the time, and a mass of raw tissue forms which bleeds easily.

Actinomycosis of the udder usually manifests itself either in the form of hard swellings in the udder, in which there are a number of small nodules, or small nodules may be felt distributed through apparently normal udder tissue.

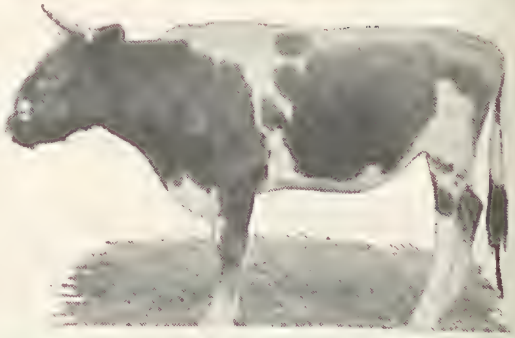
Treatment.

Superficial skin and gland lesions can be removed surgically, but this is possible only when the tumor is sharply circumscribed and surrounded by healthy tissue.

When the abscess is "ripe," a cure can often be obtained by making a fairly large incision over the swelling to allow free drainage, and by painting the cavity with tincture of iodine daily.

In valuable animals where the soft tissues are affected, and surgical interference is not advisable, the internal administration of potassium iodide (1 to 3 drams daily) dissolved in water may be tried, but as this treatment may have to be continued for a considerable period, and there is a danger of the animal becoming affected with iodine poisoning, it should be carried out only under instructions from a veterinary surgeon.

Treatment by means of intravenous injections of a solution of sodium iodide has given good results. This treatment, however, should be performed only by a qualified veterinary surgeon.



Actinomycosis of facial bones and lower jaw, in an advanced stage.

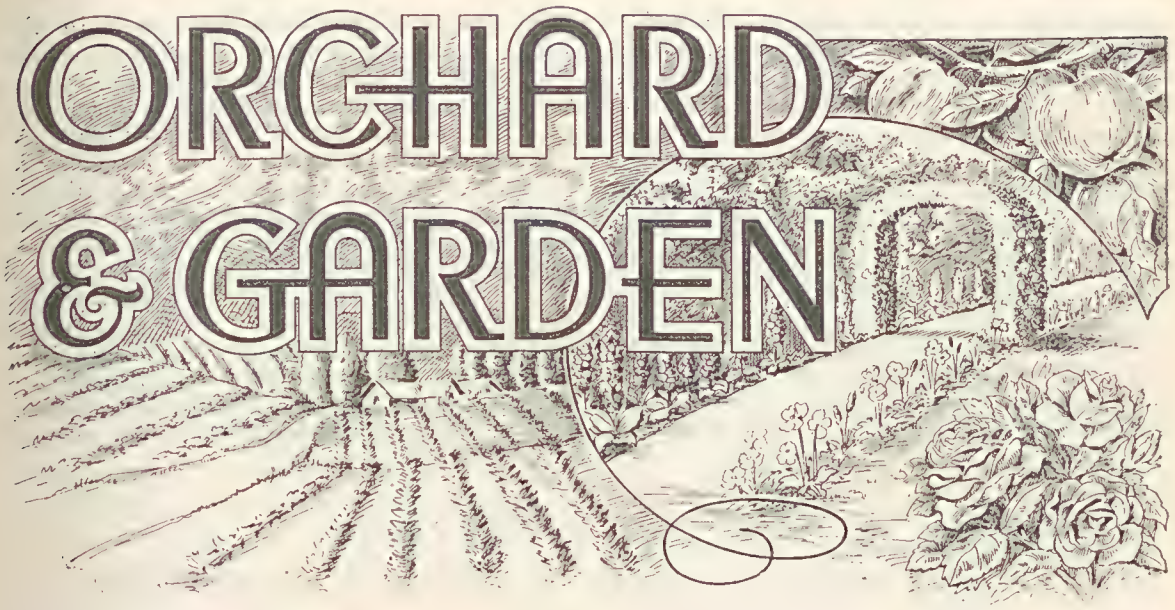
Post-mortem Appearances.

Most of the conditions described can be seen without holding a post-mortem examination. The discharge from the actinomycotic lesion usually contains fungus colonies which are gritty to the touch, and, as a rule, yellowish in colour, and may be seen with the naked eye. The jaw bones are found to be enlarged and honeycombed. On opening the nodules in the udder they will be found to consist of a fibrous capsule enclosing a yellowish pus.

Means of Spread.

Cattle affected with a discharging actinomycotic lesion are a great source of infection. As already mentioned, the fungus is usually taken in with the food. Cattle suffering from the disease and with discharging sores should never be allowed access to paddocks wherein there are healthy stock, or to feeding sheds used by other cattle. Pastures which have become infected with the fungus should be thoroughly cultivated or burned.

Actinomycosis is a notifiable disease, and all cases should be reported immediately to the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.



In the Orchard

By J. L. PROVAN, B.Agr.Sc., Senior Horticultural Instructor

ONE of the results of the very heavy and late infection of codling moth noticed in the apple and pear orchards will be that the over-wintering population will be much higher than for some years past. One method of reducing this high population is the adoption of thorough orchard sanitation methods from now until early spring. Growers realize, of course, that the control of the spring brood of codling moth really commences immediately the previous crop has been harvested. Unfortunately, too many growers rely solely on heavy coatings of lead arsenate sprays, and sometimes on persistent films of oil to combat this pest. Chemical and hessian bands were not used to the same extent this year as in previous years, and the heavy autumn infestation of codling moth is probably one of the results of the decreased use of this supplementary measure. Other reasons, of course, were economies practised by orchardists in the number and thoroughness of spray applications. If this position is to be corrected, during the winter growers must pay attention to tree trunks and branches, props and posts, picking boxes and debris around the trees, all of which act as shelter for the over-wintering larvae. Picking boxes and cases which have been used for the storage and handling of fruit should be sterilized by dipping in a boiling solution of washing soda—1 lb. in 20 gallons. Orchardists are familiar with the increased infection of fruit on the trees surrounding sheds where cases have been stored. Many growers have realized this to be such an important source of infection, that they have made their sheds and storerooms moth-proof, and have been astounded by the number of moths trapped. Other growers who have paid serious attention to orchard sanitation have reduced the cost of their spraying programme considerably and now realize that it is much better to adopt these supplementary measures than to rely only on the spray programme as they had done in the past.

Apricot and peach trees commence defoliating during the month, and where Shot Hole was prevalent, it is advisable to apply a 6:4:40 Bordeaux mixture to the trees in order to prevent this fungus from affecting buds. This autumn spray is particularly necessary in the districts of higher rainfall, and it is almost as important as the "pink-bud" 6:4:40 Bordeaux mixture applied in the spring. In the drier parts of the State, many growers rely on a later Bordeaux mixture, in addition to the spring application, and appear to satisfactorily control Shot Hole. Many almond trees this season were affected by Shot Hole, and these trees should be sprayed with the usual Bordeaux mixture when bud movement is first noticed.

The Department of Agriculture is undertaking a scheme to certify fruit-packers in Victoria, and certificates of competency in fruit-packing will be issued to packers who have attained a sufficient degree of skill in this work. Fruit-packers who desire to obtain application forms should get in touch with their local Fruit Packing Instructor, or apply direct to the Superintendent of Horticulture, Department of Agriculture, Melbourne, C.2.

In many orchards occasional trees will be noticed which are stunted and fail to grow even after more than usual care and attention have been given to them. In some cases the cause of this stunting is due to faulty root-stock, but, more frequently, to a local wet spot in the orchard, where a peculiar formation of the sub-soil has allowed an accumulation of water to come to the surface. When underground tile drains are placed through this wet spot, the trees recover fairly rapidly.

Citrus growers are experiencing difficulty in obtaining supplies of ethylene gas for the colouring of early navel oranges, and are searching for suitable substitutes. Unfortunately, many of these substitutes are dangerous to use. Ordinary coal gas contains a small amount of ethylene and can be used for the purpose of colouring citrus fruits. Acetylene also has been tried, but this gas is so dangerous that it is not recommended for general use.

In the Garden

By A. W. JESSEP, M.Agr.Sc., B.Sc., Dip. Ed., Principal, School of Horticulture, Burnley

WITH the approach of winter, the summer flowering annuals and herbaceous plants require attention. The annuals should be removed and the ground given a thorough overhaul. Dig it over and, if necessary, give it a good liming, using from 2 to 4 oz. per square yard. It should be left in this rough state throughout the winter, and then worked down early in the spring in readiness for the next season's planting.

Dahlias soon will be cut down with the frosts. When this occurs remove the tops by cutting them about 6 inches above the ground level. Two or three weeks later remove the tubers and store in a sheltered place, such as beneath a low spreading tree. Do not allow the tubers to get too dry in the spring, and occasionally check them over to see that they are not being attacked by pests.

Cut back the herbaceous plants and give the area a good forking over. Delphiniums may be removed and stored in boxes with the soil around them. In the early spring they should be divided and replanted as required. If the crowns show any signs of decay, make cuttings, using the new growth with a heel of the crown attached. Put the cuttings in sand until they root and then plant out in their permanent positions. The advantages of taking up delphiniums are that the ground can be thoroughly worked and the crowns better protected from pests during the winter months.

Late autumn is the best time of the year to plant out evergreen shrubs. If planted now they have a good chance to become established before the hot weather arrives. The shrubs to be selected for planting depend upon the environment in which they are to be placed, and the height to which they are required to grow. There are shrubs to suit every requirement, such as evergreen and deciduous, tall or dwarf, green, variegated, or autumn foliage, floral or berry types, and those having upright or pendulous habits of growth.

Some of the popular evergreen shrubs include the following varieties:—

Rhododendron.—This shrub requires a soil rich in organic matter and a sheltered, moist position. It is naturally found growing in gullies, and that type of position suits it best.

Camellia.—This old-fashioned shrub is again becoming popular, and is worthy of a place in any garden. It does well in a sheltered position, and is hardier than the rhododendron. The *Czar* is a very popular single variety, but there is a large number of beautiful double varieties.

Ceonothus is a hardy quick-growing shrub reaching a height of from 8 to 10 feet, and producing a mass of clusters of blue flowers in the spring. It will grow in almost any position, but is not very long lived.

Cestrum elegans is a very hardy plant which produces clusters of attractive tubular flowers of a red shade throughout most of the year, and particularly in the winter.

Choisya or Mexican Orange Flower is popular, not only because of its small white fragrant flowers, but also on account of its glossy green foliage. It grows in almost any position, and to a height of from 4 to 5 feet.

Eugenia or Lilly Pilly is a large shrub with small white flowers, followed by attractive almost white to purplish pink berries about the size of a cherry.

Other popular shrubs include the following:—

(*a*) For sheltered positions—magnolias, *Clethra arborea* (the lily of the valley tree), daphne, andromeda, and holly.

(*b*) For open positions—*Lagerstroemia* (the crepe myrtle), veronica, cassia, *Garrya elliptica* (male plant), podalyria, and *Cotoneaster pannosa*.

In addition to the shrubs mentioned, there are many others which are very good, and it is advisable to inspect a garden having a wide variety of shrubs when a selection is being made. A catalogue description, although helpful, is sometimes misleading unless you know the plant or see a specimen of it growing under garden conditions.

Vegetables.

The early frosts have destroyed the vines of the pumpkins, melons, cucumbers, and these should be removed. The vines usually carry a good deal of fungus disease and should be burned rather than turned under the soil. Carefully collect the pumpkins and melons and store them under cover. The area should be dug up and left in the rough so that the rain will enter freely and not run off. The ground then should be limed to help sweeten it.

The French beans will be of no further use and should be removed and burned, as the late plantings are usually attacked by pests and diseases.

Keep the growing vegetables well hoed, to enable the air to enter freely. If they are not growing satisfactorily, a dressing of market garden manure at the rate of 2 oz. per square yard should be given. Gradually hill up the cabbages, cauliflowers, and broad beans. This assists them to better withstand the winds, and also allows the excess moisture to escape along the furrows between the rows.

Cut off and remove the fronds from the asparagus bed and overhaul the soil, working in a liberal supply of farmyard manure. If any of the plants have died, remove and replace with a divided crown from one of the good plants in the bed.

The rhubarb patch requires to be forked over and a liberal supply of farmyard manure worked into the soil. If the plants have been growing in the one spot for three or more years, it would be advisable to lift them, prepare the bed again, and replant the best crowns as required.

Culinary herbs which have been in the same area for two or more years may be lifted, subdivided, and replanted as required.

Make further sowings of broad beans, peas, spinach, and leeks, and an early sowing of onions.

The berry fruits in the garden require attention. The loganberries and raspberries should have the old canes removed and the new ones tied into position. Prune the gooseberry and black and red currant bushes. If any replacements are necessary, prepare the area and plant during June and July. Remove runners from the strawberries and give the ground a good forking over, working into it any farmyard manure that is available.

The remainder of the vegetable area should be dug over, limed, and left in this rough state until needed for the spring sowings. When left in this state, the air, frost, and rain enters freely, and helps to sweeten the soil ready for the next season's vegetables.

NOTES FOR THE HOME

Jam Making from Pectinous Fruits

By Miss R. PEILE, Fruit Preserving Expert

JAM which is made from fruit possessing good quantities of pectin and acid should be clear and bright in appearance, well-set without being too stiff, and it should possess a good flavour. It is difficult sometimes to obtain all three results because the fruit varies according to its variety, its ripeness, and the season through which it has been growing. Preserving pans are different in shape and size, and the methods of preparation and cooking vary in most households.

Suitable Pectinous Fruits.

Pectinous fruits which are to be used for jam should be firm-ripe, but not immature. Pectin in conjunction with acid forms a good jelly-like set in the jam, and is found in the cell walls of the fruit. When the fruit is at the firm-ripe stage the pectin also is at the right stage of maturity. When the fruit is too under-ripe, it is unsuitable to use as it contains protopectin which does not dissolve in water, and consequently would not provide a true set. Furthermore, it is generally very acid and lacks a natural fruity flavour. In some cases, a mixture of firm-ripe and whole-ripe fruit may be used. The whole-ripe fruit will give a good colour and flavour, while the firm-ripe fruit contains pectin and acid—the two substances which must be present to form a good set.

The pectinous fruits are red, black, and white currants, firm-ripe berry fruits, green gooseberries, green quinces, sour apples, certain varieties of firm-ripe plums, and other fruits which possess a tart acid flavour, with the exception of pineapple which possesses acid but no pectin. Fruits such as very ripe apricots, sweet cherries, peaches, pears, figs, and others which are too over-ripe do not contain these substances, and the jams obtained would not have the same jelly-like set, the product being of a firm thick consistency.

The Pectin Test.

The amount of pectin contained in the fruit will govern the amount of sugar to be used. Where doubt is entertained on this point it will be advisable to test for the quantity of pectin present. When the fruit has been boiling from three-quarters of an hour to one hour, with or without water, 1 teaspoon of the juice should be taken from the pan, placed in a cup or glass, allowed to cool, and then covered with 3 teaspoonsful of methylated spirit. After standing for two minutes, the liquid is poured into another receptacle, and if the juice appears as a transparent clot, it indicates large amounts of pectin present, and shows that 1 to 1¼ lb. of sugar may be used with 1 lb. of fruit. If the clot is slightly broken, ¾ lb. of sugar may be added to each 1 lb. of fruit. If the clot is much broken, it indicates very small amounts of pectin and the jam made from such fruits would be of poor consistency. This test also may be carried out by using equal amounts of raw alcohol and juice, but as methylated spirit is more easily obtained it is advisable to use the latter.

Pectin and Acid.

The presence of pectin is important and when, by heat, it is dissolved in conjunction with acid in water or juice, it forms in the jam a jelly-like set. Acid must be present, as it is essential in extracting the pectin from the fruit and also brightens the colour of the jam and improves the flavour. If acid is lacking, it may be added in the form of lemon juice, vinegar, or citric or tartaric acid in the following proportions:—

Lemon juice—2 tablespoons to 1 lb. fruit.

Vinegar—¼ cupful to 2 lb. fruit.

Citric and tartaric acid—1 level teaspoon to 2 lb. fruit.

When using acid, it should be added when the raw fruit is put on to cook.

Adding the Sugar.

In jam-making, a proportion of the water must be driven off before the sugar is added, because the jam will not set properly until the pectin, acid, and sugar are in the right proportion, and this means the evaporation of a certain amount of water. When the sugar is added before that proportion is attained, it means that the fruit and sugar are boiled for too long a time together with the resulting jam a heavy sticky mass, caused by the high temperature to which sugar raises the jam. The high temperature also destroys the pectin and turns it into pectic acid which is insoluble in water and does not form a true set.

When making jam from plums and currants, the sugar should never be added until the skins are thoroughly soft, otherwise they are toughened at once. All fruits should be well cooked before the sugar is added, except in the case of conserves where the fruit is required to keep its shape. In this case, part of the sugar is sprinkled over the fruit overnight or the raw fruit is put into syrup immediately.

General Method for Making.

Wash and prepare the fruit which should be as fresh as possible. Berry fruits are left whole while larger fruits should be cut in pieces. An aluminium or enamel pan should be used. Put it on to cook with the amount of water necessary for the variety being used, placing a lid on the pan. Some fruits require a large amount of water, others very little, and some are boiled in their own juice only. Cook the fruit gently with the lid on the pan until it is soft. Berry fruits, with the exception of gooseberries, will take 10 to 15 minutes. Plums will take 25 to 30 minutes, and apples and quinces longer. These fruits should be cooked until the colour is partly drawn. The sugar is then added, and should be in the proportion of 1 lb. sugar to 1 lb. fruit. Remove the lid and allow the jam to cook rapidly until the setting stage is reached. This may be ascertained by placing a teaspoon of the jam on a plate and if it crinkles when pushed with the finger it is ready for bottling. It then should be poured into warm dry bottles and sealed when cold.

Faults and Remedies of Jam-Making.

When jams become mouldy, it is nearly always caused by dampness. When bottling jam, it should be poured into warm dry jars and stored in dry cupboards or shelves. The jars should be warm, as there is sometimes a danger of vapour forming when boiling jam is poured into cold jars. This vapour condenses and becomes moisture, which may cause mould on the jam after it has been stored away for some time. For the same reason, it is wise to seal down when cold, otherwise the steam from the hot jam, when coming into contact with the paraffin seal, also condenses and sometimes forms mould under the seal. When jam is only slightly affected one inch of the surface should be scraped off, the jam reboiled, and fresh paraffin wax poured on.

When jam is affected by fermentation, it generally means that it has been insufficiently cooked or the sugar added was in too small an amount. Fermentation will not occur when the jam has been boiled to the correct consistency—that is, when the sugar and juice and the pectin and acid are in the right proportion to one another. Jam which is only slightly fermented should be put back into the pan and boiled rapidly until a thicker consistency is attained. However, when it is badly affected, the fault cannot be corrected, and the jam should be discarded.

Recipes.

The following recipes are delicious, and should prove popular for the housewife:—

Quince and Pear Jam.

6 lb. quinces, 6 lb. cooking pears, 12 lb. sugar, 1 pint water. Boil quinces and pears until soft, add sugar, and boil until the mixture jellies in a saucer.

Peach and Pineapple Chips.

6 lb. prepared peaches; 2 lb. pineapple, 6 lb. sugar. Skin and stone the peaches and cut into chips, not too large. Skin the pineapple, being careful to remove the eyes and core, then cut into fine chips. Strew portion of the sugar over the prepared peaches and leave for some hours, or overnight; add pineapple and bring to boiling point slowly. Retain that heat until the fruit is cooked, then add the balance of the sugar, and, when dissolved, the mixture should be given a good sharp boiling until of the desired consistency.

Neutralization of Sour Cream for Buttermaking

II.—The Titratable Acidity of Cream and Buttermilk and the pH of Butter

By W. J. WILEY, D.Sc., Dairy Research Officer of the Council for Scientific and Industrial Research, and F. S. J. NEWMAN, B.Agr.Sc., Dairy Technologist

THE previous paper of this series, which was published in the March issue of this *Journal*, pointed out that measurement of the pH of butter is used as a control of the efficiency of neutralization and an index of the possible keeping quality of the butter in cold storage. The pH of the butter is controlled at the factory by the titratable acidity of the cream which is churned. In spite of this, very little work has been published showing the relationship between the titratable acidity of cream at churning and the pH of the resultant butter. Consequently, the buttermaker is frequently at a loss to know what acidity he should aim at in the cream in order to make a butter of the desired pH.

The following paper describes work designed to establish—

(*a*) The relationship between the titratable acidity and pH of raw and of neutralized, pasteurized creams.

(*b*) The relationship between the titratable acidity of neutralized, pasteurized cream and the butter and buttermilk made from it.

(*c*) The relationship between the titratable acidity and pH of buttermilk.

(*d*) The change in pH of butter during cold storage.

Experimental Methods.

The raw creams used in this investigation had a wide range of acidity. The butter-fat content was about 42 per cent. For the most part they were typical of the acid creams received by many Australian factories. Most of the "neutralizations" were made with sodium bicarbonate or proprietary neutralizers of the sesquicarbonate type. A few creams were neutralized with a good quality commercial hydrated lime.

About 600 lb. of cream were neutralized for each churning, pasteurized in a small size "Tandem Vacreator," cooled, held overnight, and churned next day. The butter granules were washed once. All the butters were salted so as to contain about 1.3 per cent. of salt. Various temperatures of pasteurization and "intensities of vacreation" were used, but, as these had little influence on the properties discussed in this paper, they will not be described.

The titratable acidity of the raw cream was determined by the method described in the previous paper of this series. The acidity of the neutralized, pasteurized cream was determined in a similar manner except that the procedure of boiling before titrating was dispensed with, as it was found that boiling for two minutes had a negligible influence on the acidity of such creams. The acidity of the buttermilk was determined by taking an 18-ml. sample and titrating without boiling or diluting.

The pH measurements were made with the quinhydrone electrode. Cream and buttermilk were not diluted before making the determination. The measurement was made on butter by separating the serum by melting at 40 deg. C. and centrifuging. The pH of the serum was measured without diluting.

The Titratable Acidity and pH of Raw Cream.

Figures showing the relationship between the titratable acidity and pH of milk have been published by numerous workers. In particular, Sharp and McInerney (1), with a large number of fresh and sour milks of widely varying acidities, found a reasonably close correlation between the two factors. They also found a similar relationship for cream if allowance were

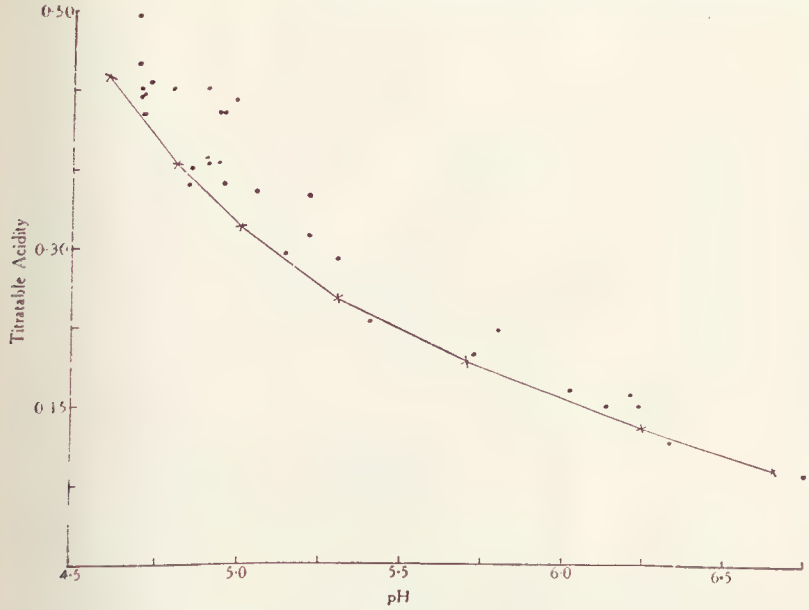


Fig. 1.—The titratable acidity and pH of raw cream.

made for the higher fat content of the cream influencing, by dilution, the titratable acidity. However, Murray and Weston (2), working with Australian creams, found only a general relationship between titratable acidity and pH with considerable variations between individual samples. They used a colorimetric method to determine the pH which was later criticized by Sharp and McInerney, who stated that it could give an error up to 0.25 units. The variations obtained by Murray and Weston were far greater than this, nor could they be caused by any reasonable variations in the fat contents of the creams examined. In view of this discrepancy with Australian creams, it was thought desirable to give the results obtained in the present investigations.

Fig. 1 gives the results obtained from 32 samples of raw cream as received at the factory. After examining this number of samples it was evident that a relationship similar to that found by Sharp and McInerney existed. The continuous curve represents the average values for the titratable acidity and pH of sweet and sour milk given by these workers, the titratable acidity being re-calculated to that of a 42 per cent. cream. Most of the experimental values lie above the curve. This is almost certainly due to the effect of emulsified fat on the quinhydrone electrode, as demonstrated by Unmack (8). For emulsions up to 50 per cent fat the correction for true pH, established by this worker, is — 0.0035p, where *p*, is the percentage of fat. Application of this factor to the present experimental results would make the two curves almost coincident.

The mean fat percentage of the cream was 42, with a variation of ± 4 per cent. of fat. This variation in fat percentage could cause a variation of 0.07 per cent. in the titratable acidity of two creams having acidities of the

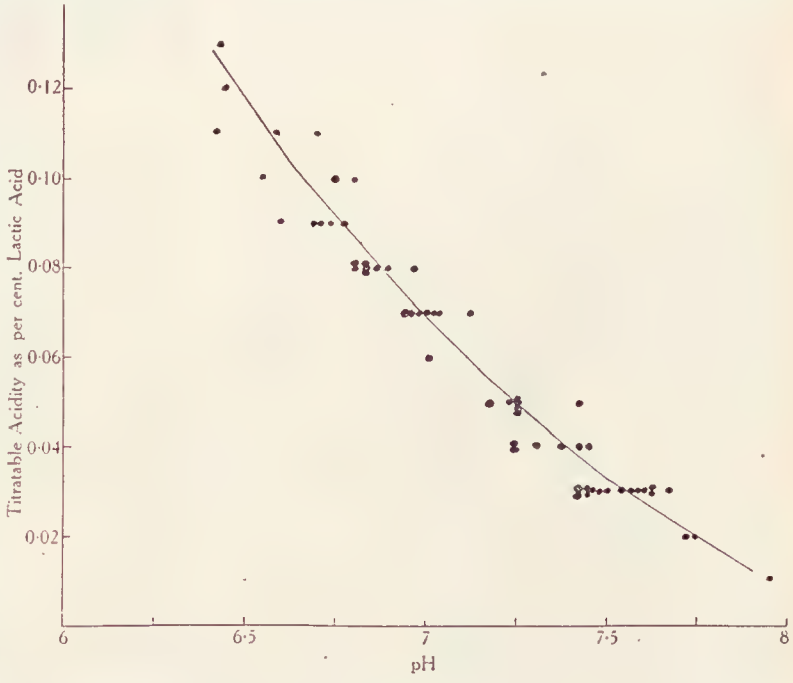


Fig. 2.—The titratable acidity and pH of neutralized, and pasteurized cream.

order of 0.4 per cent. A strict relationship between pH and titratable acidity cannot be expected with such creams.

The Titratable Acidity and pH of Neutralized, Pasteurized Creams.

Wiley (3) has demonstrated a relationship between these factors over a wide range of acidities. His figures were obtained on creams pasteurized in the laboratory, and do not include many in the range of low acidities now generally adopted in Australia for buttermaking. The following results were obtained with creams treated by factory methods and neutralized within the approximate range of 0.12 to 0.01 per cent. acidity.

Figure 2 gives the results of 59 examinations of neutralized, pasteurized cream. There is a close correlation between pH and titratable acidity. The maximum variation in titratable acidity from the mean at any pH is seldom greater than about 0.01 per cent., which is about the limit of accuracy of the titration.

The Titratable Acidity and pH of Buttermilk.

Figure 3 shows the relationship found between the titratable acidity and pH of 59 samples of buttermilks examined. The relationship is similar to that found for the same properties in raw and pasteurized creams. One might expect a somewhat closer correlation in the case of buttermilk because the influence of varying proportions of fat on the titratable acidity would not be present. However, varying dilutions of the buttermilk with rinsings when transferring the cream to the churn, and sometimes with break water, would cause appreciable variations in the titratable acidity of the buttermilk. Nevertheless the correlation between pH and titratable acidity is sufficiently close to enable the titratable acidity of the buttermilk to be used as a check on the accuracy of neutralization of the cream.

The pH of the Butter and Buttermilk and the Cream from which they are made.

Since the pH of the butter is measured on the serum, and this serum is, in effect, buttermilk diluted with varying amounts of water (and, in the case of a salted butter, containing added salt), one would expect that the pH of cream, butter, and buttermilk would not differ considerably. Hunziker, Cordes, and Nissen (4) found the pH of the three products to be practically the same for samples having values between pH 6.50 and 6.70. Above pH 6.70 the butter had a higher value than the buttermilk. McDowall and McDowell (5), who worked with butters of similar acidity to those discussed in the present paper, found good agreement between the pH of the three products, but did not publish figures showing how close one might expect the agreement to be.

Table 1 summarizes the results obtained for 56 churnings. The samples have been grouped with creams having the same titratable acidity. In general the pH of cream, buttermilk, and butter agree reasonably closely. The maximum difference found between the mean pH of the cream and that of the buttermilk group in any group was 0.13 pH, and between the mean pH of the cream and that of the butter was 0.19 pH. There were in each group, however, quite appreciable differences from the mean

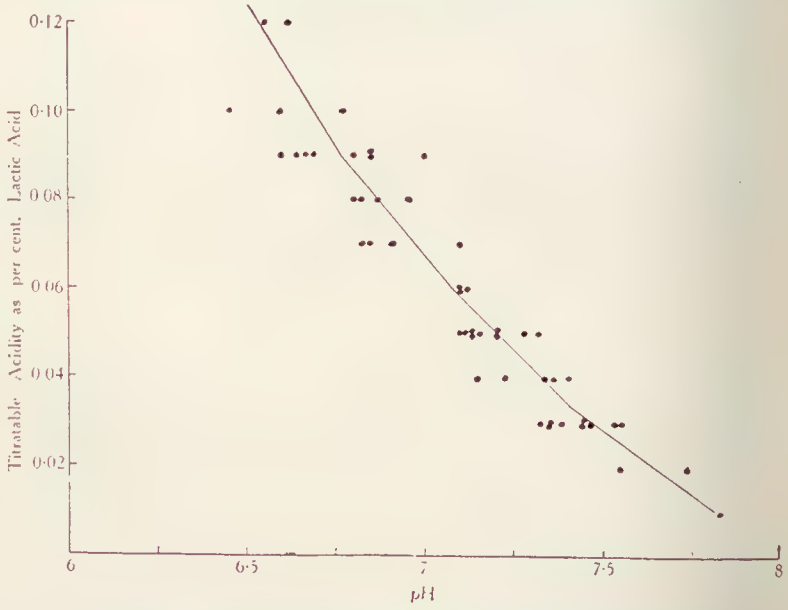


Fig. 3.—The titratable acidity and pH of buttermilk.

TABLE 1.—MEAN pH OF CREAM, BUTTERMILK AND BUTTER FOR CREAMS OF VARYING ACIDITIES.

Number of Samples.	Cream.				Buttermilk.			Butter.		
	Titratable Acidity.	Mean pH.	Average Difference from Mean.	Maximum Difference from Mean.	Mean pH.	Average Difference from Mean.	Maximum Difference from Mean.	Mean pH.	Average Difference from Mean.	Maximum Difference from Mean.
2	·02	7·76	·02	·02	7·72	..	·01	7·92	·02	·02
15	·03	7·48	·08	·20	7·40	·09	·27	7·54	·17	·39
6	·04	7·34	·07	·11	7·21	·08	·17	7·38	·09	·14
7	·05	7·26	·05	·17	7·15	·05	·18	7·30	·12	·31
7	·07	7·01	·04	·12	6·92	·10	·18	6·99	·04	·12
8	·08	6·85	·04	·12	6·75	·09	·15	6·79	·18	·36
5	·09	6·70	·05	·11	6·57	·06	·13	6·66	·14	·23
3	·10	6·70	·10	·15	6·64	·10	·16	6·51	·25	·38
3	·11	6·56	·10	·15	6·46	·09	·18	6·42	·09	·15

pH values, particularly with butter. When the values for all the samples are considered rather than mean values, the correlation between cream pH and butter pH is not as close as would be expected from the assumption that the butter serum is solely buttermilk. Figure 4 shows the variations that can occur. The salt in these butters varied between 1 and 1.5 per cent. and the dilution of the serum by "make-up" water also varied for different churnings. Salt reduces the pH of the serum as measured by the quinhydrone or glass electrode, and dilution raises the pH so that variations in these factors would have influenced the pH of the butter serum. We have not demonstrated, however, that these were the causes for the discrepancies between cream and butter pH.

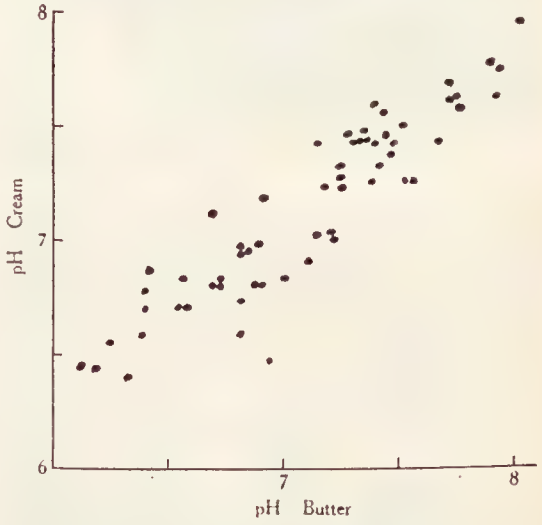


Fig. 4—The pH of cream and the pH of butter.

The Change in the pH of Butter on Cold Storage.

Table 2 summarizes the change in the pH of 67 butters on storage for four months at 15 deg. F. The butters varied in pH from 6.13 to 8.61.

The results confirm those of Parfitt (6) and McDowall and McDowell (loc. cit.), who demonstrated that with few exceptions the pH of the butter did not alter greatly during storage. The butters of high pH showed a tendency to decrease in pH during storage. With one exception all the butters which decreased by more than 0.2 pH had an initial pH over 7.70. Loftus Hills, Scharp, and Bellair (7) also noted a "distinct tendency for the pH of high pH butters to decrease more than that of low pH butters."

TABLE 2.—CHANGE IN pH OF BUTTER ON STORAGE.

	Over ·03.	Increase in pH.			No Change.		Decrease in pH.		Over 0·3.
		0·2–0·3.	0·1–0·2.	0–0·1.	0.	0–0·1.	0·1–0·2.	0·2–0·3.	
Number of Samples ..	3	3	18	15	4	6	6	3	9
Mean Initial pH	7·03	7·07	7·04	7·03	7·34	7·10	7·29	7·50	8·04

Discussion.

The results have shown that there is a reasonably close correlation between the titratable acidity and pH of raw cream, of neutralized pasteurized cream, and of buttermilk. Moreover, there is some correlation between the pH of cream and of the butter and buttermilk made from it. However, none of the correlations is exact, and variations from a strict relationship occur which cannot be accounted for by working error. The relationship between the titratable acidity of the cream and the pH of the butter is of considerable practical importance and is controlled by (*a*) the relationship between cream acidity and pH, and (*b*) the relationship between cream pH and butter pH. As there is not an exact correlation in the case of either (*a*) or (*b*), it is important to know what the combined effects of these variables can be; in other words, how closely one can hope to control the pH of butter by adjusting the cream to a given titratable acidity.

Table 3 gives the results obtained on churnings made during the course of this work.

Table 3.—The pH of Butters Made from Cream of Different Titratable Acidities.

Number of Samples.	Cream Acidity per cent. Lactic Acid.	Butter pH.		Difference.
		Highest.	Lowest.	
3	0·11	6·57	6·33	0·24
3	0·10	6·89	6·25	0·64
5	0·09	6·83	6·43	0·50
8	0·08	7·13	6·43	0·70
7	0·07	7·23	6·70	0·53
7	0·05	7·56	7·21	0·35
6	0·04	7·48	7·24	0·24
15	0·03	7·93	7·33	0·60
2	0·02	7·94	7·90	0·04

In considering the above figures it should be remembered that all the acidity determinations were made by one man by a standardized technique. Even under these conditions, however, we consider the working error to be "0.01 per cent. lactic acid." Therefore, some of the butters which are recorded as being made, for instance, from cream containing 0.08 per cent. acidity may have been made from creams of 0.09 or 0.07 per cent. acidity. Moreover, the correlation between cream pH and butter pH was found to be imperfect, appreciable variations in the butter pH from creams of the same pH being encountered. The gross result is that there can be fairly large variations in the pH of butters produced from creams supposed to be of the same initial acidity. The experimental results show that the difference can amount to about 0.70 units of pH.

The difference in butter pH should be borne in mind when attempts are made to control factory neutralization from a central laboratory by measurement of butter pH. Moreover, it is now well established that butter for cold storage should not have a pH below 6.6–6.8 and should preferably be somewhat higher. The results show that an acidity higher than 0.08 per cent. may give a butter that is too acid. Admittedly factories sometimes make butter of satisfactory pH from cream of supposedly higher acidity. This could be due to variations already discussed and also because the titration to determine the per cent. acidity is carried beyond the end point used in this work, so that the factories' "per cent." acidity would be higher than that recorded by us.

If the above points are remembered, Table 4, generalized from our results, should be of value when attempting to manufacture butter of a given pH.

Table 4.—The Acidities of Cream, Buttermilk, and Butter.

T.A. Cream, &c.	T.A. B.M.	pH B.M.	pH Butter.
·02	·02	7·7	7·9
·04	·05	7·2	7·4
·06	·07	7·0	7·1
·08	·09	6·8	6·8
·10	·12	6·6	6·5

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Registration of Stallions

Twenty-first Annual Report

By R. J. de C. TALBOT, B.V.Sc., Chief Veterinary Inspector

DURING the season 1940-41 the number of stallions presented for examination which were certificated was 93 less than for the previous season. Because of the abnormal conditions that the world crisis has brought about in all primary industries, this decrease was to be expected, but in view of the rising costs of fuel, &c., it is to be hoped that farmers on average-sized blocks will recognize that the horse is still the most economical power unit.

Bonus for Foals.

Recognizing the importance of the horse-breeding industry to the State, and with a view to encouraging the breeding of the right type of draught horse, the Government has decided that, for the next five years, a bonus of £2 will be paid to the owner for every foal the progeny of a registered Clydesdale, Suffolk Punch, or Percheron stallion, and a mare approved by the Chief Veterinary Officer of the Department of Agriculture. This bonus will be payable in respect of foals born during the present season, and full particulars of the scheme may be obtained on application to the Chief Veterinary Inspector. It is hoped that this bonus scheme will have the effect of stimulating the horse-breeding industry.

During the season under review the total number of stallions registered was 1,107, made up of 741 draught, 203 light, and 163 pony stallions. As will be seen on reference to the accompanying tables, this number is lower than that registered for the year 1939-40, but if the boom years 1934 to 1938 are excluded, it is well above the average of registrations since the inception of the Horse Breeding Act. It seems fairly safe to assume that, with conditions as they are, a further drop in the number of stallions registered may be expected during the coming season.

Prices for working horses during the year, although lower than those received some few years back, have remained steady, and good types are always in good demand at fair prices.

The quality of horses submitted for examination was satisfactory and, in fact, was higher than for many previous years. Of the stallions examined this year 180 were registered and 63 were refused registration. Of these latter 29 or 11·9 per cent. were rejected on account of unsoundness, and 34 or 13 per cent. because they were below a reasonable standard in respect of type, conformation, and/or breeding. The total percentage of rejections, as will be seen, was 25 per cent., which, although slightly higher than in some previous years, is lower than the figure for 1939-40. In the draught classes 17 per cent. were rejected on account of unsoundness, the principal cause of rejection being sidebone. Although this figure is lower than in some previous years it still is not satisfactory and undoubtedly is due in some measure to

owners breeding from unsound mares and to the retention by owners, for use with their own mares, of unsound stallions which have been refused registration. As is provided for in the Act, 101 of these unsound stallions were so retained for the year 1940-41.

With regard to the examination of mares, breeders are reminded that, under a voluntary scheme, stud book mares may be submitted for examination for soundness to the Veterinary Officer at scheduled parades. A fee of £1 is charged for the examination and certificates of soundness are issued for three-year-olds and four-year-olds, and a life certificate for mares of five years or over. It is hoped that during the coming season all stud breeders will present at least some of their mares for examination.

Two-year-old Colts.

As was mentioned in last year's annual report, an amendment of the Horse Breeding Act now provides for the registration of two-year-old colts whose owners desire to give them some

SUMMARY OF EXAMINATIONS, 1940-41.

	Draught.		Light.		Pony.		Total.	
	Examined. 149.	Certificated. 103.	Examined. 52.	Certificated. 40.	Examined. 42.	Certificated. 37.	Examined. 243.	Certificated. 180.
	Rejected.	Percentage Rejected.	Rejected.	Percentage Rejected.	Rejected.	Percentage Rejected.	Rejected.	Percentage Rejected.
Bog Spavin	2	1·342	..	..	..	..	2	·823
Bone Spavin	..	..	..	..	..	..	..	..
Chorea (Nervy)	..	..	..	..	..	..	..	..
Curb	..	..	..	..	..	..	..	..
Ringbone	..	..	1	1·923	1	2·381	2	·823
Sidebone	24	16·107	1	1·923	..	..	25	10·288
Stringhalt	..	..	..	..	..	..	..	..
Thoroughpin	..	..	..	..	..	..	..	..
Through unsoundness ..	26	17·449	2	3·846	1	2·381	29	11·934
Through disapproval ..	20	13·423	10	19·230	4	9·524	34	13·991
Total	46	30·872	12	23·076	5	11·905	63	25·925

SUMMARY OF EXAMINATIONS, 1939-40.

	Draught.		Light.		Pony.		Total.	
	Examined. 254.	Certificated. 177.	Examined. 61.	Certificated. 46.	Examined. 60.	Certificated. 50.	Examined. 375.	Certificated. 273.
	Rejected.	Percentage Rejected.	Rejected.	Percentage Rejected.	Rejected.	Percentage Rejected.	Rejected.	Percentage Rejected.
Bog Spavin	2	·787	..	..	..	..	2	·533
Bone Spavin	..	..	1	1·639	..	..	1	·267
Chorea (Nervy)	3	1·181	1	1·639	..	..	4	1·067
Curb	..	..	2	3·279	..	..	2	·533
Ringbone	1	·394	1	1·639	2	3·333	4	1·067
Sidebone	48	18·897	3	4·919	1	1·666	52	13·866
Stringhalt	..	..	..	..	..	..	..	..
Thoroughpin	..	..	..	..	1	1·666	1	·267
Through unsoundness ..	54	21·259	8	13·115	4	6·665	66	17·600
Through disapproval ..	23	9·055	7	11·475	6	10·000	36	9·600
Total	77	30·314	15	24·590	10	16·665	102	27·200

REGISTRATION REFUSED

List of Stallions in respect of which Certificates of Registration have been refused but which, the owners having paid the prescribed fee, may be retained for breeding purposes with owners' own mares

Name.	Age* and Class.	Owner and Address.
Unnamed	A. L.	M. Cole, Kooreh
Unnamed	A. P.	O. G. Hobson, Yarram
Unnamed	6 P.	Miss G. Small, Ferntree Gully
Abercorn Duke	3 D.	K. N. Ellis, Greta
Alto Bells	A. P.	J. Barty, Redesdale
Barney Baron Belmont	A. D.	A. T. Cole, Wodonga
Baron Bold	A. D.	Mrs. D. A. Daly, Detpa
Baroona Regal Duke	4 D.	E. J. Black, Casterton
Bell Boy	A. T.	A. G. Turnbull, Tyrendarra
Bellman	A. D.	Wharton Bros., Cochrane's Creek
Benambra	A. D.	Nankervis Bros., Corryong
Ben Bowyang	6 D.	J. Wilson, Nar Nar Goon
Black Arbuckle	A. D.	G. A. Liersch, Homecroft
Black Baron	A. D.	A. E. Tucker, Mitchell's Hill
Black Star	A. L.	D. Madill, Koyuga South
Bloomfield Talisman	3 D.	J. C. Thornton, Waaia
Bowler	6 D.	A. C. Masters, Corryong
Box Valley Flash Prince	3 D.	F. S. Schmidt, Dimboola
Buonaparte	A. D.	W. J. Soutter, Benambra
Campaspe Prince	A. D.	G. P. Starke, Kyneton
Cannie Shanter	A. P.	U. Ramsay, Winchelsea
Clan MacKenzie	A. D.	J. Purdie, Wunghnu
Clyde	A. D.	G. Thomson, Kilcunda
Craigie Don	A. D.	C. Butcher, Chillingollah
Craigie Master Stroke	3 D.	E. Roberts, Calder's L.B., Lake Rowan
Dandy Bell	A. L.	H. Spice, Bacchus Marsh
Danny Boy	4 L.	W. Meagher, Danyo
Douglas	A. D.	J. A. McDonald, Gre Gre Central
Drumgrange Prince	5 D.	Ballintine Bros., Goorambat
Drummer	A. D.	F. Bird, junr., Yarram
Drumport	4 T.	Mrs. R. M. Hill, Kaniva
Earl of Lavereen	3 D.	A. E. Menzel, Gunbower
Ethalldale Scotson	3 D.	H. H. T. Kramer, Lawloit
Fifeness Flash Baron	A. D.	H. L. Treasure, Stratford
Flash Direct	A. L.	C. H. Evans, Rathscar
Forest Dale Remark	3 D.	E. F. Arthur, Wail
Gay Silver	A. D.	S. A. Bull, Paschendale
Glen George	4 D.	G. Peters, Tallandoon
Glen McBride	A. D.	H. Jager, Swan Hill
Grafton Duke	4 D.	C. H. Roediger, Lorquon
Grampian's Favourite	A. D.	J. Whiting, Terang
Haboob	4 P.	J. E. D. Crozier, Casterton
Hill King	A. L.	A. E. Cummings, Berrimal
John McElwyn	6 P.	D. Bamford, Beeac
Kawaran Liston Craig	A. D.	V. O. Frost, Netherby
Kawaran Strathwell	5 D.	G. T. Deckert, Kinimakatka
Keayang	A. D.	J. Blain, Dixie
Koimbo Lad	4 D.	T. L. Lamble, Bolton
Korongah Bold Eric	A. D.	W. R. Hines, Donald
Little Wonder	A. P.	H. F. Ridd, Molesworth
Lord Roberts	A. D.	R. Wight, Woodside
Lord Victor	A. D.	J. Montgomery, Milawa
Macland's Duke	4 D.	T. J. Miners, Sea Lake
Major Laddie	A. D.	G. R. Stratton, Echuca
Mallee King	4 D.	S. R. Pearce, Woomelang
Manya Thrill	3 L.	E. W. Wheeler, Manya North
Maxmay	A. D.	D. S. Stewart, Swan Hill
Model	4 D.	G. B. Wilson, Machin's L.B., Timboon
Noble	A. D.	E. Crowe, Tatong
Pete	A. P.	J. Knight, Goornong
Peter	3 D.	C. A. Deckert, Boinka
Pettadale's Pride	A. D.	D. Green, junr., Nullawill
Pride	8 D.	A. J. Chamberlain, Arnold
Prince	A. D.	R. A. Estoppey, Briagolong
Prince	A. D.	F. Justin, Camperdown
Prince	A. D.	M. Findlay, Mincha
Prince	A. D.	A. H. Fawson, Bairnsdale
Prince's Prize	A. D.	Moran Bros., Bullharre
Professor	5 P.	Estate of C. L. Forrest, Irrewarre
Prooinga	A. D.	Malook Singh, Manangatang
Punch	A. D.	J. Sansom, Bayles
Punch	A. D.	W. Earl, Woodside
Punch	A. L.	C. Churchill, Kilcunda
Pyjamas	A. P.	Boyd Bros., Koroit
Robin Lea	A. D.	J. and W. Bradshaw, Skipton
Rob Roy	A. P.	Miss E. A. Small, Hawthorn
Royal Coastguard	A. D.	A. J. Millar, Hopevale
Royal Hero	A. D.	Mrs. P. E. Etherton, Broughton
Royal King	A. D.	D. Gorman, Crossley
Royal Mattie	A. D.	J. Kelson, Kirkstall
Royal Prince	5 D.	J. H. Crawford, Dunkeld
Sailor	A. D.	A. G. Turnbull, Tyrendarra
Sam	A. D.	A. G. Turnbull, Tyrendarra
Scotch Pride	A. D.	J. M. Shelton, Kurraca West
Scotland's Duke	A. D.	H. F. Quick, Brim
Silver	A. L.	H. B. and F. A. Birch, Tabberabbera
Sir Michael	A. D.	E. Lewis, Tatong
Sordino	A. T.	L. Matthews, Benambra
Sunnyland's Crystal	A. D.	Evans Bros., Moyhu
Sunset Trail	A. T.	Yarraberb Pty. Ltd., Raywood
Surprise Power	6 P.	W. T. Jensen, Morwell
The Gaffer	A. L.	G. Phelan, Corop
Tiger	A. D.	Mrs. E. M. Morrison, Boinka
Waldaira's King Knight	A. D.	Boyd Bros., Koroit
Warrangee Oswald	A. D.	G. Lord, Eskdale
Wee McGregor	5 P.	J. H. Waugh, Seymour
Widgiews Alverton	A. D.	J. O'Leary, Glenormiston South
Worawingeth Allenby	A. D.	W. T. Rowe, Wallinduc
Worthy Glen	A. D.	C. Heffernan, Iona
Yangery Prince	A. D.	A. Skillbeck, Southern Cross
Young Toby	A. D.	W. J. Newton, Lower Cape Bridgewater

* *Note.*—Age in years. A., aged; D., draught; L., light; P., pony; ½T., thoroughbred.

stud service. The amendment provides that owners must make application for registration on the prescribed form, and the application must be accompanied by a fee of £1. The colt must be submitted for examination at a scheduled parade, and, if passed, will be registered as a colt for one year.

During the season 1940-41 ten colts were submitted for examination, and of these seven were registered.

Appeals.

No appeals were lodged against the decision of veterinary officers for the season under review.

Parades for Coming Season.

It has been found necessary to somewhat curtail the advertised parade list for the coming season, as several veterinary officers are engaged on military duties, and with petrol rationing in force, every endeavour is being made to avoid unnecessary travelling wherever possible.

At the same time, however, in order that stallion owners shall have every facility for the examination of their horses any centre, as advertised last year, will be again visited by a veterinary officer this season if a request is made by a stallion owner for an examination at that centre.

The advertised list of scheduled stallion parades includes some hundred centres, but in addition there is a further list of 250 places which, if early application is made, will be visited by a veterinary officer on a date to be fixed. The date of such visit will be notified as soon after receipt of the application as possible.

It is felt that by such an arrangement, provided that owners forward their applications by July 1st as is required, every stallion will be examined as early as in the past and without the slightest unnecessary inconvenience to owners.

Copies of the lists of scheduled centres and list of registered stallions are obtainable on application to the Chief Veterinary Inspector, Live Stock Division, Department of Agriculture, Melbourne, C.2.

Application for registration must be made on the prescribed form before the 1st July and must be accompanied by a fee of £3 (£1 for registration, and £2 compensation fee). The necessary forms may be obtained from secretaries of agricultural societies and from officers in charge of police stations, or from the Department of Agriculture.

Change of ownership must be notified without delay in order that certificates of registration may be endorsed accordingly. Registration expires within 30 days of change of ownership, unless the required notice is given.

Tubercle Free Herds

The following herds have been declared free of tuberculosis under the scheme conducted by the Department of Agriculture. Under this scheme a tuberculosis-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests, or, upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

Accredited Tubercle Free Herds.

Name.	Address.	Number in Herd.	Name.	Address.	Number in Herd.
Ballarat Mental Hosp.	Ballarat	78	Longerenong Agricultural College	Dooen	46
Banyule Stud Pty. Ltd.	Heidelberg	34	Onley, W. H. ..	"Glenholme," Caldermeade	67
Black, Estate, late I. S.	"The Cottage," Mount Noorat	46	Payne, A. E. T. ..	"Yarra View," Lilydale	77
Black, Miss Grace ..	Mount Noorat ..	35	Payne, T. E. N. ..	"Woodburn," Kilmore	58
Dennis, Mrs. A. A. ..	Frankston	19	Powell, T. S. ..	"Carellen," Mansfield	41
Dookie Agricultural College	Dookie	81	Read, Estate, late John D.	"Springhurst Estate," Springhurst	112
Dunbar and Clark, Messrs.	"Hazeldean Dairy," Mount Dandenong	15	Reid, Ralph G. ..	"Holmwood," Koowee-rup	78
Geelong Grammar School	Corio	58	Richardson, Bros., Messrs.	"Faldinghurst," Upper Beaconsfield	30
Gorman, A. W. ..	"Cathcart," Alexandra	80	Samuel, B. T. ..	Lang Lang ..	60
Henderson, J. L. and E. I.	Wangaratta ..	95	School of Horticulture	Burnley	6
Holloway, R. W. ..	Caldermeade ..	56	State Experiment Farm	Rutherglen ..	51
Kelly, C.	"Glenmore," Creighton's Creek, Euroa	17	State Research Farm ..	Werribee	211
Lawrence, P. H. ..	"Rainga," Tarrawarra	60			

In addition to the above-mentioned herds there are 104 commercial dairy herds containing 3,317 head of cattle which may be considered free of tuberculosis. All these herds have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds, they cannot be considered as accredited under the accreditation scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

There are also 113 herds in which 5,986 head of cattle have passed one test, and may be considered therefore to be in process of becoming tuberculosis-free herds.

Myrtleford Tobacco Experiment Area

Soil and Plant Investigations

By F. PENMAN, M.Sc., Assistant Research Chemist

Summary.

Investigations have been made of the nature of the soils and of the composition of tobacco plants on a holding at Myrtleford, which is being developed by the Victorian Department of Agriculture as a tobacco experiment area. Three main soil types have been defined, and representative samples analyzed by both physical and chemical methods. The distribution of the soil types over the holding is shown on a soil map. The soils are immature alluvial types representative of the North-east river-flat country which has grown the bulk of the Victorian tobacco crop in recent years.

The soils contain considerable proportions of silt and fine sand and are heavier than those used for production of bright flue-cured types of tobacco in the United States of America. The lighter soils in this area, however, have produced high quality tobacco, and it appears that the explanation lies in the relatively low degree of stickiness of the clay material present in them and in their considerable contents of organic matter. These soils have free mechanical properties, readily working to a deep open tilth, are freely permeable to water, and appear to be well-drained and aerated within the root zone of tobacco.

Acid reactions prevail in these soils, the reactions being in a range suitable for tobacco culture. While there are considerable total amounts of potash in these soils, the more readily available forms of potash are present in amount hardly sufficient for optimum growth of tobacco. Both total and relatively available forms of phosphorus occur in notable quantities in those soils which have carried regular crops of tobacco during the past 30 years. From soil and plant analyses, it appears that nitrogen becomes available in these soils in sufficient quantity to meet the requirements of tobacco. The bearing of these findings concerning plant nutrients in the soils on fertilizer practice for tobacco is discussed.

The compositions of leaves and stems of tobacco plants grown on the three main soil types are compared with analyses recorded abroad. Both major nutrients and "minor elements" were considered in this work. There is evidence that the supply of boron in the lighter soils may be insufficient for optimum results with tobacco, and it is suggested that this condition, together with some deficiency in available potash, may be the cause of certain abnormalities in the mineral composition of tobacco grown in this area. Analyses of plants affected by "stunt" or "yellow dwarf" reflect the disturbances in mineral nutrition of the tobacco plant resulting from this virus disease.

DURING 1939, the Victorian Department of Agriculture acquired a leasehold over a property in the Ovens River valley, near Myrtleford. This area is representative of the lands in the North-east, in the Ovens and neighbouring valleys, on which the greater part of the Victorian tobacco crop has been raised in recent years. As the property will be developed by the Department as a tobacco experiment area, an examination has been made of the soils of the holding. This was commenced in November, 1939.

The objects of the work were to survey the soils of the area, in order to provide a basis for the laying-out of experiments on particular types of soil, and to give detailed descriptions of the main soil types so that they could be compared

A healthy young crop of tobacco growing on soil type 1.

with soils growing tobacco elsewhere. In addition, the opportunity was taken to examine the relations between soil conditions and the nutrition of the tobacco plant on the main soil types.

Location and Environment.

The property is located on the southern bank of the Ovens River, being parts of allotments 13 A1 and 14A, Parish of Myrtleford, County of Delatite. The area involved is 39 acres 2 roods 3 perches. The holding lies about one mile from Myrtleford in a westerly direction, towards Merriang.

The height of the area above sea-level is approximately 670 feet. Spurs of the Buffalo Ranges frame the southern outlook, rising from low hills a mile or so away back to the heights of 5,000 feet or more at Clare Peak and Mount Buffalo, which lies about 14 miles away, east of south. To the east, past Myrtleford, is the Happy Valley and its mountainous watershed. To the north and north-east lies the Barwidgee Creek watershed, with Mount Stanley at the peak, at about 3,400 feet. Downstream in the Ovens Valley, in a north-westerly direction, the river flat country opens out with the accession of tributary streams including the Buffalo River and the Whorouly, Stony and Burgoigee Creeks. Upstream, the united Ovens and Buckland Rivers are joined by the Buffalo Creek, all running to the north and west from the Dividing Range, and by the Happy Valley and Barwidgee Creeks, which come in from the north and east.

The Ovens and its tributaries carry in their fairly fast streams a mixture of alluvial material derived from the wash from granitic slopes, from metamorphic rocks of varying nature, and from Ordovician mudstones and sandstones. The soils of the area at present under discussion have developed from alluvial material of this kind.

The original vegetation of the area was red gum (*Eucalyptus rostrata*), some stumps of which are still in evidence. The land has been cleared and under cultivation for more than 30 years.

Climatic conditions are specified by Table 1., compiled from data supplied by the Commonwealth Meteorologist. The rainfall averages are based on records for 36 years, the other entries on records for five years only.

The annual rainfall of nearly 35 inches is reasonably well distributed, with a definite winter

TABLE 1.—METEOROLOGICAL DATA FOR MYRTLEFORD.

——	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Mean Maximum Temperature °F.	86·4	85·8	80·4	70·7	63·9	55·5	54·2	58·6	63·7	70·4	77·7	82·4	70·8
Mean Minimum Temperature °F.	53·7	53·8	49·0	43·9	38·6	36·4	35·0	38·6	38·9	43·2	47·1	51·0	44·1
Mean Relative Humidity %	55	62	71	79	91	93	93	85	77	70	61	56	74
Mean Rainfall Points	173	171	236	227	315	469	399	396	331	311	207	228	3,463

maximum in June, and a summer minimum in January and February. The moderate extent of the summer rainfall and the fairly low relative humidities prevailing during that period necessitate the installation of irrigation plant (spray systems) to ensure adequate water supply for crops like tobacco. The average minimum temperature of approximately 47°F. for November suggests that late frosts may be a source of danger in some years to seedlings of summer crops.

Soils of the Area.

The soils of this holding have been classified into three main types, which together cover the bulk of the area. The remainder is accounted for by small occurrences of minor soil types, mostly in depressions. The central part of the area is occupied by a rather heavy brownish-surfaced soil, which, particularly towards the south, is at a somewhat higher elevation than the rest of the block. This appears to be the remnant of an old river terrace, which has been cut away and flanked by lighter, more recent, sediments during changes in the course of flow of the Ovens River. Apart from small patches of sand which occur irregularly towards the northern end of the area, apparently in parts of former river courses, the soil, Type 1., which occupies the eastern part of the area is the lightest on the block. Type 2, on the western sections is rather heavier and darker-coloured than Type 1, and between these two types is the "terrace" soil already mentioned—Type 3, the heaviest of the main soil types—and a fairly extensive occurrence of a soil which has been distinguished as the grey-brown phase of Type 2.

The distribution of the various types of soil over the holding is shown on the accompanying soil map. Because of the considerable variability of alluvial soils of this nature, the boundaries between occurrences of the different types of soil are rather indefinite, so that the bounding lines shown on the map really represent zones of transition between soil types.

SOIL TYPE 1.

A representative profile of soil Type 1 is shown in Fig. 1.

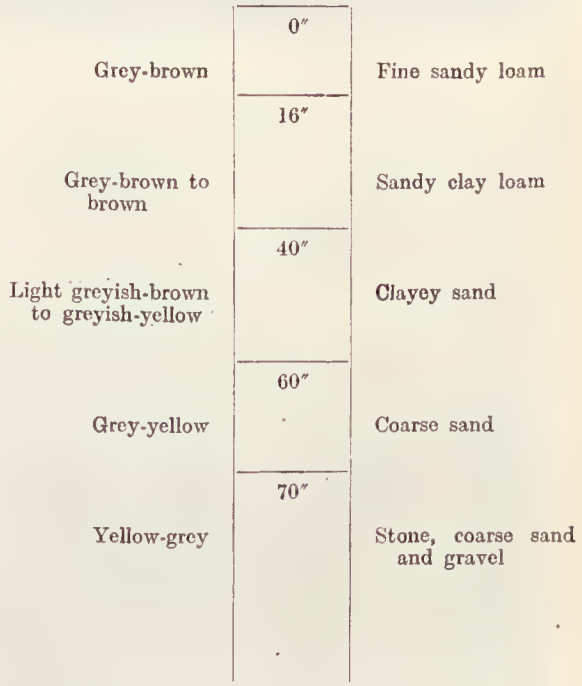


Fig. 1.—Profile of Soil Type 1.

The surface soil may be brown in colour, and varies through grey-brown shades to brownish-grey. The fine sandy loam surface soil is never less than 10 inches deep. The subsoils are variable in texture, but seldom heavier than sandy clay loam at any point down to 6 feet.

Fig. 2.—Profile of soil type 1, exposed along the bank of the Ovens river.

A photograph (Fig. 2) of the profile of this soil type, exposed along the bank of the Ovens River, shows the bed of water-washed stone and gravel at about 6 feet from the surface, overlaid by sand and clayey sand, which is readily eroded when the river is high.

When the river is lower, as shown in the photograph, the stone and gravel layer operates as an effective beaching against erosion. The surface and sub-surface horizons of fine sandy loam or sandy clay loam hold together well, but collapse in blocks when undercut by removal of the less coherent horizons below them. Early stages of this undercutting process may be noted in the photograph.

Soil Type 2.

The heavier texture and generally darker colour of the surface soil are the chief features distinguishing Type 2 from Type 1, but there are other differences, including the greater average depth to the sand in the deeper subsoil. Mottling of the deeper subsoil is fairly common in this type and this, together with generally darker colour than in Type 1, indicates that this soil type is not as well drained as the lighter type. The succession of horizons is similar to that in Type 1, but the differences noted made it desirable to assign two soil types rather than to consider the two as phases of the one type.

There is considerable variation in colour in the surface soil of this type; the grey-surfaced occurrences, conforming with the profile illustrated above, have been distinguished as the *grey phase* of Type 2, while the browner areas have been called "*grey-brown phase*". There is a certain amount of patchiness within each phase and certain areas in the "grey-brown phase" land are really brown. Most of these are rather too small to map individually, but one occurrence of considerable size is noted on the soil map; this area is on a local elevation, and in addition to its colour is distinguished by a shallow depth of profile to the sand: these features make it very susceptible to drying-out.

In localized areas of Type 2, there is a tendency for heavier material than sandy clay loam to occur in the stratified subsoils below 2 feet. Clay loam or even light clay horizons may occur between overlying sandy clay loam and underlying sand horizons in a few areas which have been classified as Type 2; these heavier horizons are mottled, particularly in the vicinity of local depressions.

Fig. 3 illustrates the chief feature of a typical profile of soil Type 2.

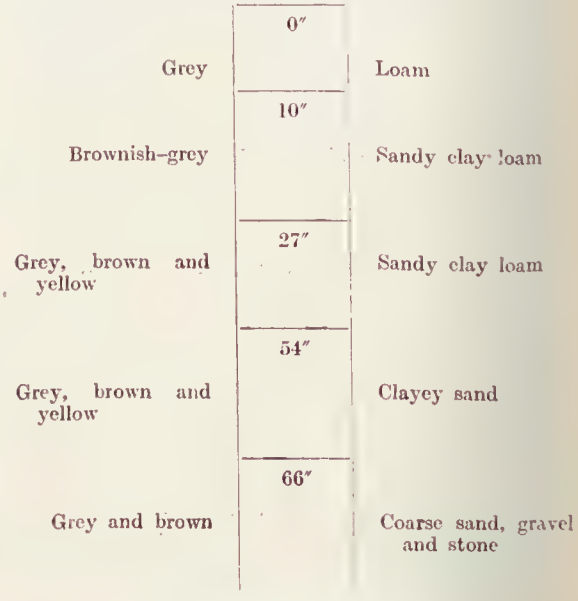


Fig. 3.—Profile of Soil Type 2.

Soil Type 3.

The outstanding feature of soil Type 3, apart from its occurrence at somewhat greater elevation than the others, is the heavy character of the surface soil, which makes it difficult to work to a satisfactory tilth and causes it to set hard. A representative profile is shown in Fig. 4.

	0″	
Brown		Clay loam
	10″	
Light grey-brown to greyish yellow		Clay loam to light clay
	24″	
Yellow, with grey and brown		Sandy clay loam
	34″	
Grey-yellow		Clayey sand
	46″	
Grey-yellow		Coarse sand, stone and gravel

Fig. 4.—Profile of Soil Type 3.

The surface soil of this type ranges in colour from brown, on the more typical areas, through greyish-brown to grey-brown, and in texture from loam to clay loam. The sub-surface horizons reach the clay loam to light clay texture range, and frequently are fairly sharply differentiated from the surface soil by the change to yellowish colour at depths of about 10 inches. This change may be noted in Fig. 5, a photograph of the upper part of a profile of this type. The depth of the profile to the bed of coarse sand, gravel and stone is comparatively shallow in most cases, averaging a little less than 4 feet.

Fig. 5.—Profile of soil type 3 exposed in a pit.

Although soil of this type would not be selected for tobacco, its presence on tobacco lands raises the subject of the best method of handling it.

River-flat land at Myrtleford; soil type 3.

Probably treatment with gypsum at the rate of about 2 tons per acre, and putting the land under clover or trefoil as often as possible would benefit this type of soil. Also, this type has an inherent need for higher phosphate applications than the other types.

Soil Type 4.

Type 4 is one of the minor types, occurring in the heavier depressions. The profile shows grey to grey-brown loam or clay loam at the surface, clay loam to light clay of similar colour at ten inches, resting on mottled grey and brown, grey and yellow or yellow and brown material of texture ranging from fine sandy clay loam to light clay. This mottled subsoil extends from about 16 inches to approximately 66 inches, being then succeeded by grey coarse sand and gravel.

Soil Type 5.

A small occurrence of this soil type lies on the northern edge of the allotment. It is in a depression, evidently part of an old river course. At the surface, the soil is a grey-brown to grey sandy loam, resting on grey-brown loam at nine inches, brown sandy clay loam at 14 inches, followed by greyish brown clayey sand from 27 inches.

Sand Patches.

A few small areas with sand surface soils occur towards the north and eastern edges of the allotment. Most of these are too small to delineate individually, but two of the larger patches are indicated on the soil map. When in Type 2 land, these patches show about 3 inches of light grey sand succeeded by an equal depth of grey sandy loam, which merges into the sandy clay loam subsoil usually found in Type 2. When in Type 1 land, the sand patches tend to occur in small depressions which appear to have formed part of the old river course leading out to the occurrence of soil Type 5; these sand patches have in places as much as 2 feet of grey-brown sand over the sandy clay loam or clayey sand found in the subsoil of Type 1.

Development of the Soils.

Considering the soils as a whole, there is a common feature in the deep subsoil of gravelly coarse sand and water-washed stone, which appears to form a bed under most of the holding. All the soils are stratified, certainly in the subsoil, probably also in the surface horizons. The soil profiles as they stand now have been influenced to comparatively slight extent by their environment subsequent to deposition in their present positions; their properties are determined mainly by the character of the alluvium deposited at different periods. The soils are thus immature from the aspect of soil development. Possibly Type 3, apparently the oldest soil, diverges slightly from this generalization, showing some effects of local environment on soil profile development.

The fact that these are mainly young alluvial soils explains the variations found within types as discussed above with particular reference to surface soils. The stratified deposition has given rise to considerable variation in the subsoils also; some profiles do not show any coarse sand horizon within 6 feet, in others, a sand horizon may occur at only 2 feet from the surface. The important point is that, however much these subsoil horizons may vary, they are usually light textured, of such a nature as to offer but little impedance to movement of water. Among the rare exceptions to this are the cases, mentioned under Type 2, in which material as heavy as light clay may occur between lighter horizons in the subsoil down to depths of 4 or 5 feet.

Mechanical Analyses of the Soils.

The purpose of these analyses is to check the descriptions of soil texture made in the field and particularly to allow quantitative comparisons of the physical constitutions of these soils with those available for soils growing tobacco in other parts of the world. In taking samples of the profiles, the surface 5 inches was sampled separately, although the differences between this layer and that succeeding it usually were very slight and probably depended largely on the influence of cultivation. Mechanical analyses, carried out by the International pipette method with sodium hydroxide dispersion, are set out in Tables 2A, 2B, and 2C.

Naturally, the analyses of surface samples are of special interest, particularly in the present instance, when the field descriptions given to these soils place them in rather heavier categories than those used by practical tobacco men to describe them. The recorded analyses substantiate the field descriptions used in surveying these soils. In this connexion, the figures for clay content are of special significance, and it will be noted that total clay content is about 17 per cent. in the surface soils of Type 1, about 22 per cent. in those of Type 2 and about 29 per cent. in Type 3.

Mechanical Analyses and Other Data for Myrtleford Soils.

TABLE 2A.—Type 1.

	Grey-brown Fine Sandy Loam.					
Depth (inch)	0–5	5–10	10–24	24–39	39–60	60–82
Texture	F.S.L.	F.S.L.	F.S.L.	S.C.L.	Cl.S.	Coarse S.
Gravel and stone	..	..	..	..	..	..
Coarse sand	2·8	2·6	3·1	1·2	7·4	48·5
Fine sand	46·8	45·4	60·8	50·9	68·6	38·8
Silt	27·6	27·1	19·4	31·3	13·7	6·5
Clay < 0·002 mm.	17·4	17·2	13·3	15·3	9·3	6·0
Clay < 0·001 mm.	12·5	12·4	10·1	11·2	7·2	5·3
Moisture	1·8	2·3	1·3	1·0	0·6	0·3
Loss on acid treatment	0·3	0·3	0·1	0·3	0·1	0·1
Loss on ignition	6·3	6·1	4·0	4·7	3·3	2·0
Total soluble salts	0·021	0·017	0·015	0·017	0·010	0·008
Chlorides (as Cl.)	0·004	0·003	0·003	0·001	0·002	0·001
Nitrogen	0·134	0·132	0·053	0·064	0·039	..
Reaction (pH value)	5·7	5·5	4·9	4·7	4·9	5·2

TABLE 2B.—Type 2.

	Grey or Grey-brown Loam.								
	Grey Phase.						Grey-brown Phase.		
Depth (inch)	0–5	5–10	10–27	27–36	36–54	54–75	0–5	5–10	10–24
Texture	L.	L.	S.C.L.	S.C.L.	S.C.L.	Cl.S.	L.	L.	S.C.L.
Gravel and stone	0·1	..	..	..	..	0·5	0·2	0·6	2·0
Coarse sand	2·2	1·8	1·7	2·3	3·1	8·8	5·5	6·3	15·8
Fine sand	29·7	30·3	37·7	47·7	57·3	62·8	32·4	30·0	32·0
Silt	35·7	36·4	35·0	29·8	23·0	15·7	33·5	35·0	30·7
Clay < 0·002 mm.	21·3	22·4	19·4	16·0	14·5	9·0	23·3	22·8	20·2
Clay < 0·001 mm.	15·2	15·5	14·5	11·8	10·6	7·2	..	..	..
Moisture	3·2	2·7	2·5	1·5	0·9	0·8	1·4	1·5	1·2
Loss on acid treatment	0·8	0·5	1·0	1·2	0·6	0·3	1·4	1·5	0·5
Loss on ignition	8·7	8·6	7·4	5·8	4·3	4·4	7·7	7·6	4·9
Total soluble salts	0·020	0·026	0·017	0·017	0·016	0·013	0·020	0·017	0·017
Chlorides (as Cl.)	0·004	0·005	0·003	0·002	0·002	0·001	0·003	0·002	0·003
Nitrogen	0·212	0·214	0·121	0·092	0·060	..	0·202	0·171	0·101
Reaction (pH value)	5·5	5·3	5·1	5·1	4·9	5·1	5·4	7·1	6·9

TABLE 2C.—Type 3.

	Brown Clay Loam.							
Depth (inch)	0–5	5–10	10–14	14–24	24–30	30–43	43–52	52–62
Texture	C.L.	C.L.	C.L.–L.C.	C.L.	S.C.L.	Cl.S.	Coarse S.	Coarse S.
Gravel and stone	0·1	0·4	1·8	0·5	1·1	5·4	29·5	15·3
Coarse sand	4·5	5·1	6·6	6·1	17·1	42·4	57·8	80·9
Fine sand	18·3	17·7	18·6	26·0	38·8	37·0	29·0	12·4
Silt	39·6	38·9	40·4	40·7	28·6	13·6	8·5	4·0
Clay < 0·002 mm.	29·2	31·8	29·2	25·2	15·3	7·3	5·6	3·6
Clay < 0·001 mm.	21·1	22·8	21·8	18·2	11·6	6·3	4·6	3·2
Moisture	2·7	3·2	3·0	2·2	0·8	0·4	0·3	0·2
Loss on acid treatment	0·4	0·2	0·3	0·1	0·1	0·0	0·1	0·0
Loss on ignition	7·8	7·3	6·3	5·0	3·5	2·1	1·5	1·0
Total soluble salts	0·020	0·018	0·014	0·014	0·013	0·032	0·010	0·012
Chlorides (as Cl.)	0·002	0·002	0·004	0·003	0·002	0·013	0·001	0·002
Nitrogen	0·151	0·122	0·085	0·050	..	..	..	..
Reaction (pH value)	5·8	5.5	5.6	5·6	5·5	5·6	5·8	6·0

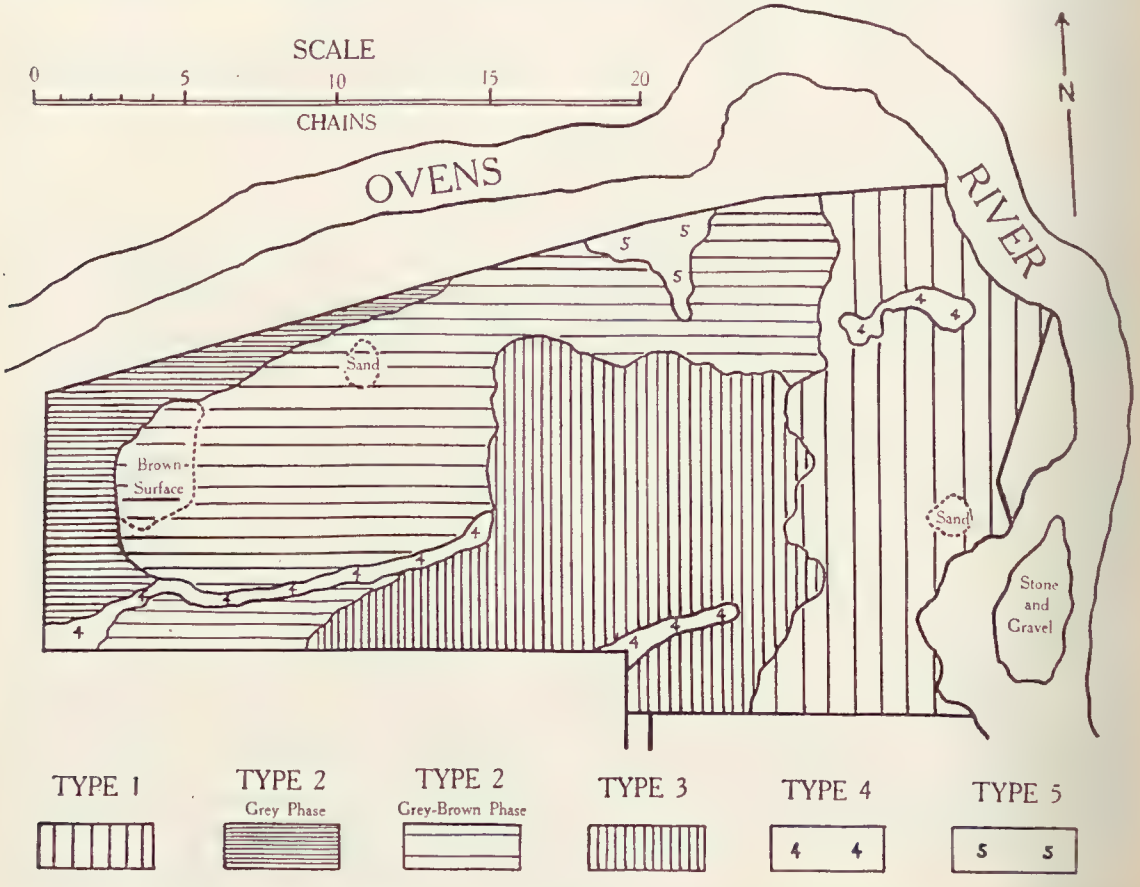
Abbreviations for texture descriptions used in the above table are:—S., sand; Cl.S., clayey sand; F.S.L., fine sandy loam; L., loam; S.C.L., sandy clay loam; C.L., clay loam; L.C., light clay.

Figures are percentages of dried sieved soil unless otherwise indicated. "Gravel and stone" is given as percentage of the field sample.

Considering the mechanical analyses for the complete profiles, the silt fraction is an important constituent, at least down to about 30 inches, as is often the case in alluvial soils of this kind. In the Type 3 soils, silt constitutes about 40 per cent. of the total in the upper horizons. The distribution of fine sand in the profiles is somewhat similar to that of silt, except that the fine sandy influence runs deeper, particularly in Types 1 and 2, where figures of about 60 per cent. are recorded deep in the profiles. In most of the samples, except those deep subsoils described as "coarse sand", fine sand preponderates over coarse sand, to notable degree in the upper horizons. The proportion of "gravel and stone", i.e., particles larger than the coarse sand fraction, is negligible in the upper horizons and reaches high figures only in the "bed" material of gravelly coarse sand and stone.

The finer physical constituents of soil exert dominant influence on properties, such as water-holding capacity, aeration and internal drainage, which are very important in growth of tobacco of high quality. It is significant, therefore, that the proportion of clay and silt in the main root-zones of these soils are such that their mechanical compositions differ in an unfavourable direction from those soils on which bright types of tobacco are commonly grown abroad. It would appear that a favourable distribution of physical constituents is represented by a clay content of about 8 per cent. to 12 per cent., a silt content of about 15 per cent., and a total sand content of about 70 per cent. The figures given in Tables 2A, 2B, and 2C, show that the surface soil of Type 1 has a total sand content of almost 50 per cent.; the corresponding figures for Types 2 and 3 are roughly 35 per cent. and 23 per cent. respectively.

Type 3 is recognized as a difficult soil and one that would not normally be selected for tobacco, but Types 1 and 2, particularly the former, work down to a deep, open, mellow tilth and have grown good tobacco. It appeared possible that either the amount or the nature of the finer clay



Plan showing soil types of the Tobacco Experiment Area, Myrtleford.

material in these soils might be such as to minimize, in conjunction with organic matter which was judged to be present in fair quantity, the effects of relatively high total contents of clay. Determinations of the clay fraction finer than 0.001 mm. were, therefore, carried out, to supplement the usual determinations of "clay" which refers to particles with an equivalent diameter less than 0·002 mm. The results are shown in Tables 2A, 2B, 2C. Although it was anticipated that the proportion of the finer clay to total clay might be lower in these soils than is usually the case, this proportion is about 72 per cent. for the surface horizons of all three soil types, and is not particularly low. It appears from their general behaviour that the clay material in Types 1 and 2 has a comparatively low degree of stickiness, and, on the basis of the above discussion, their good physical properties in the presence of considerable contents of total clay fraction may be ascribed to that condition, and to the presence of fairly large amounts of organic matter. Examinations showed that these soils have free mechanical properties and high permeability to water.

Soil Nitrogen and Organic Matter.

The contents of total nitrogen at various depths in the profiles are shown in Tables 2A, 2B and 2C. The figures decrease with increasing depth, but even below 2 feet values as high as 0·09 per cent. are recorded. In Type 1 and the grey phase of Type 2, there is very little difference in nitrogen content between the two 5-in. subdivisions of the surface horizons; there is a definite lowering of nitrogen content below the surface in the grey-brown phase of Type 2, but a similar effect in Type 3 is proportionally greater.

In the surface soils, nitrogen content is particularly high in the grey phase of Type 2, which appeared in the field to have the highest content of organic matter. The nitrogen content of Type 2 is notably high in relation to its clay content; Type 3 is on a much lower plane than the other types on this basis. In all these types, the nitrogen content is very high in comparison with those of soils like the Norfolk and Cecil series which grow bright flue-cured types of tobacco in the U.S.A.—their nitrogen contents are of the order of 0·05 per cent.

In Table 3 are assembled data on nitrogen, carbon and total organic matter contents of the surface soils, total organic matter being estimated from the carbon content. The carbon/nitrogen ratios are normal, covering the range 10·3 to 12·8, the highest ratio being for Type 3. The total organic matter contents suggest that during the summer there is likely to be considerable decomposition of soil organic matter under an open crop like tobacco. Probably this effect is important in maintenance of the good structure of these soils.

TABLE 3.—NITROGEN, CARBON AND ORGANIC MATTER IN MYRTLEFORD SURFACE SOILS.

(Percentages on dry basis.)

—	Nitrogen.	Carbon.	Organic Matter.
	%	%	%
Type 1	0·134	1·58	2·7
Type 2—			
Grey phase	0·212	2·44	4·2
Grey-brown phase ..	0·202	2·08	3·6
Type 3	0·151	1·93	3·3

Hydrochloric Acid Extracts of Soils.

The contents of phosphoric acid, potash, lime, and magnesia, soluble in strong hydrochloric acid, are given in Table 4 for a number of soils.

TABLE 4.—CHEMICAL ANALYSES OF SOILS.

(Percentages of air-dry soil.)

—	Depth. (inch).	P_2O_5.	K_2O.	CaO.	MgO.
		%	%	%	%
Type 1 ..	0–5	0·18	0·61	0·17	0·38
	5–10	0·17	0·39	0·13	0·29
Type 2—					
Grey phase ..	0–5	0·24	0·62	0·14	0·37
	5–10	0·22	0·55	0·15	0·47
Grey-brown phase ..	0–5	0·25	0·34	0·17	0·43
	5–10	0·19	0·39	0·15	0·50
	10–24	0·12	0·31	0·03	0·38
Type 3 ..	0–5	0·23	0·91	0·28	0·52
	5–10	0·23	0·94	0·24	0·50

Except for some weakness in lime content, these analyses reveal very strong reserves of nutrient material. Soils of the types previously referred to as growing satisfactory bright tobacco in U.S.A. seldom contain more than 0·05 per cent. phosphoric acid (P_2O_5), whereas these surface Myrtleford soils all contain approximately four times that amount. For potash (K_2O), the American soils usually have a content of about 0·10 per cent., although analyses showing more than 2 per cent. of potash are on record. Lime (CaO) contents are greater in these Myrtleford

soils than in the majority of the American bright tobacco soil types, but are within the range of variation of the latter. The contents of magnesia (MgO) given in Table 5 show a consistently high level for this constituent.

For all the soil types, the analyses for the sub-surface 5 inches are comparable with those for the surface 5 inches. In the one profile for which analyses below 10 inches are given, a general lowering is evident of the content of nutrient material, this being particularly notable in the case of lime.

Much of the material brought into solution by extraction with strong hydrochloric acid may be from soil minerals which are relatively unavailable under field conditions. It is specially desirable, therefore, in considering a quick-growing crop like tobacco, to seek estimates of the proportions of plant nutrients which are in relatively available forms. Particular attention has been given to phosphoric acid and potash in this respect.

"Available" Phosphoric Acid and Potash.

Phosphoric Acid.—Figures for the amounts of phosphoric acid soluble in a weak solution of sulphuric acid (Truog's procedure) are given in Table 5.

TABLE 5.—"AVAILABLE" P_2O_5 AT VARIOUS DEPTHS IN MYRTLEFORD SOILS.

(Parts per million.)

—	Depth.	P_2O_5.
	inches.	
Type 1	0–5	224
	5–10	161
	10–24	12
	24–39	8
	39–60	12
Type 2—		
Grey phase	0–5	211
	5–10	159
	10–27	114
	27–36	234
	36·54	26
Grey-brown phase ..	0–5	309
	5–10	107
	10–24	27
Type 3	0–5	86
	5–10	70
	10–14	70
	14–24	34

These amounts of relatively available phosphoric acid are remarkably high for Victorian soils. For Types 1 and 2, which presumably have been fertilized more heavily as they have grown more crops than Type 3, the proportion of the "total" phosphoric acid which is in the more readily available condition is about 10 per cent. Below the surface soil, there is the usual fairly marked diminution of this form of phosphorus, but the figures are still remarkably high, at least down to 10 inches, and in one profile the very high result of 234 parts per million was found as deep as 27–36 inches. The figures suggest that certain of these soils contain appreciable amounts of relatively available phosphoric acid native to the soils or subsoil, but probably the larger parts of the phosphorus found in this form in the upper horizons is residual from phosphatic fertilizer applications.

It has been found in America that old tobacco fields may contain large amounts of total and available phosphate (Anderson et al, 1927). For example, on old tobacco lands in Connecticut, on which no response to phosphatic fertilizer was obtained, it was found that soils which had been in tobacco for less than five years averaged 1,528 lb. of total phosphorus per acre, those which had been cropped to tobacco for from 5 to 20 years averaged 2,655 lb., and those in tobacco for 20 or more years averaged 3,855 lb. These authors conclude that phosphatic fertilizer is unnecessary for a large part of the tobacco grown under their conditions on old tobacco land.

The amounts of total phosphoric acid in these Myrtleford soils correspond to the higher quantities of phosphorus per acre quoted above. In addition, Table 5 shows that the availability of this phosphate is relatively high. Large applications of superphosphate are commonly used for tobacco, and it will be shown later that the tobacco crop takes from the soil only a few pounds of phosphoric acid. The building up of large phosphate reserves in the soil under these conditions is, therefore, readily explicable.

The amounts of phosphate in the more readily available condition in the surface foot in the lighter Myrtleford soils corresponds to something approaching the phosphate content of 2 tons of superphosphate per acre. It appears that the tobacco plant should be able to draw to considerable extent from these reserves, and that the only phosphatic application necessary should be a relatively small one close to the plant at planting time to ensure good initial development and root establishment. On Type 3, which is not a normal tobacco soil, conditions are rather different from the aspect of much lower "available" phosphate in the soil and from the fact that the soil is much heavier, so that phosphatic fertilizer is likely to be required in greater quantities than on the lighter soils.

Potash.—Two methods of analyses have been used to examine the availability of potash in these soils—Dyer's method, using 1 per cent. citric acid solution for extraction, and the determination of exchangeable potassium (by Hissink's procedure). Results of these analyses are given in Table 6.

TABLE 6.—CITRIC ACID-SOLUBLE POTASH AND EXCHANGEABLE POTASH IN MYRTLEFORD SOILS.

(Potash as K_2O, percentage of air-dry soil, in surface soils 0–5 inches.)

	Citric Acid—Soluble Potash.	Exchangeable Potash.
	%	%
Type 1	0·009	0·007
Type 2—		
Grey phase	0·023	0·025
Grey-brown phase ..	0·009	0·006
Type 3	0·012	0·010

The two methods of analysis give results agreeing closely for these soils. As other evidence suggests that the figures found for the grey phase of Type 2 may be too high to be taken as generally representative of that soil type, it may be said that the proportion of potash in a relatively available condition in these soils is only a small fraction of the total amount present. Tobacco is a crop which appears to need a certain "luxury consumption" of potash for best results, and from consideration of Victorian experience relating "available" potash with crop response to potash fertilizer, it is considered unlikely that a quick-growing crop with high potash requirement could be completely satisfied by soils with analyses of this order. The analyses therefore indicate that responses of tobacco to potash fertilizer are likely to be obtainable on these soils. Further indications of the status of these soils with respect to available nutrients may be obtained from analyses of water-soluble constituents in the soils and by analyses of tobacco plants grown in this area.

Water-Soluble Salts in the Soils.

In Tables 2A, 2B, 2C, are given figures for total amounts of water-soluble salts and for chlorides (expressed as chlorine). It is clear that neither chloride nor any other soluble salt is present in any of the samples in sufficient quantity to cause any harm to tobacco. More detailed analyses of soluble salts present in 1 : 5 soil : water extracts were carried out on samples representing the surface 10 inches of each of the three main types, with results shown in Table 7.

TABLE 7.—ANALYSES OF WATER-SOLUBLE SALTS IN SOILS.

(Expressed as parts per million of air-dry soil.)

	Type 1.	Type 2.	Type 3.
Potassium ..	18	42	30
Sodium	7	16	8
Calcium	24	30	30
Magnesium ..	16	18	14
Carbonate (CO_3) ..	nil	nil	nil
Bicarbonate (HCO_3)	58	55	61
Sulphate (SO_4) ..	56	62	68
Chloride (Cl) ..	15	38	18
Phosphate (as P_2O_5)	0·1	0·7	0·2

Apart from bicarbonate, which is often the dominant anion in soils of this nature, sulphate is outstanding among the soluble salts, probably as a residue from superphosphate applications. Chloride is present in definite but moderate quantities and phosphate is detectable in the water-soluble form. Appreciable amounts of compounds of chlorine and sulphur are normal constituents of the tobacco plant, and the above analyses suggest that these are present in sufficient quantities in water-soluble form in the soils. Among the cations, potassium is proportionally higher than usual. Another soluble salt, namely nitrate, will be discussed later.

Irrigation is used widely in the tobacco growing areas of North-Eastern Victoria.

Exchangeable Cations.

All these soils contain exchangeable hydrogen ion, but, as their reactions are in a normal range for tobacco, no particular attention was given to analytical determination of this exchangeable cation, except that indications were obtained that the proportion of exchangeable hydrogen to metallic cations was low in the surface soil, increasing with decrease in reaction pH. The amounts of exchangeable metallic cations found in surface soils (0–5 inches) are given in Table 8.

TABLE 8.—EXCHANGEABLE CATIONS IN SURFACE SOILS.

	Total Metallic Cations as Milligram Equivalents per 100 gm. of Soil.	Percentages of Total.			
		Ca.	Mg.	Na.	K.
Type 1	6·9	71	22	5	2
Type 2—					
Grey phase ..	7·4	65	25	3	7
Grey-brown phase ..	6·7	76	22	0	2
Type 3	11·4	69	28	1	2

These results are of normal character for Victorian soils, calcium being dominant and magnesium of considerable importance as exchangeable cations. Exchangeable potassium has been discussed already, and Table 8 shows that exchangeable sodium is present in normal small proportions.

Reaction pH.

The reactions of all soils examined are given in Tables 2A, 2B, 2C. The surface soils vary in reaction from pH 5·4 to pH 5·8, and are, therefore, within the normal range for tobacco. As exchangeable hydrogen appears to be fairly low, any attempts considered necessary to raise the calcium status of these soils should be with restricted amounts of free lime or with a salt such as gypsum or with a combination of these methods.

In the subsoils, reaction is fairly variable, ranging from pH 7·1 in the grey-brown phase of Type 2, which appears to be somewhat exceptional in the subsoil from the reaction aspect, to pH 4·7 in the deeper subsoil of Type 1.

Free Water in the Soils.

With a bed of gravelly coarse sand and stone of indefinite depth under most of the holding and the Ovens River in close proximity, free water occurs at some depth in the subsoil in most bores. It may be expected that the level of this free water will be determined largely by river level: at the time of examination in November, 1939, the Ovens had been at a high level for some months. Depths from the surface to the free-water level varied from 14 inches, in depressions, to more than 8 feet. The average depth over most of the allotment was about 64 inches, greater depths occurring in the central and southern sections. Probably in most summers the free-water level in the soils is too deep for subsoil water to be of any material benefit in helping to meet the water requirements of a tobacco crop.

A further article on soil conditions in relation to the nutrition of the tobacco plant will be published in a subsequent issue of this Journal.

Worm Drench for Horses

For general purposes the following treatment for worms in horses is suggested:—The horse or horses suspected of worm infestation should be given three small bran mashes for the first day, i.e., one in the morning, one at midday, and one in the evening, and nothing else. All food must be withheld overnight, and in the morning on an empty stomach give a drench consisting of—

Pure turpentine .. .. 2 oz.
Raw linseed oil (or liquid paraffin) .. .. 1 pint.

The drench should be well shaken and given slowly. The ingredients should be obtained from a chemist to ensure purity. This treatment can be followed in four hours by a small bran mash, after which the usual diet may be resumed in the evening.

Should this treatment prove ineffective a dose of oil of chenopodium may be given after an interval of fourteen days. The dose of this drug is 4 to 5½ drachms for an average-sized horse given in a pint and a half of raw linseed oil which should be followed in two hours by a further dose of 1½ pints of raw linseed oil alone. This treatment is more expensive than turpentine, as each dose will cost between three and four shillings. Great care should be taken in administering the dose, which is definitely dangerous in the presence of constipation and gastro-intestinal or febrile disturbances.

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Issued by direction of the Hon. E. J. Hogan, M.L.A., Minister of Agriculture.

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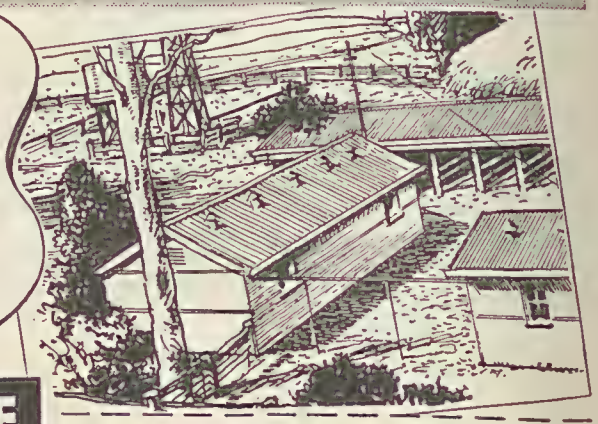

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The Journal of the DEPARTMENT of AGRICULTURE of VICTORIA

Journal of Agriculture, Victoria—June, 1941.

WAR-TIME AGRICULTURE IN VICTORIA

An address by Mr. H. A. MULLETT, B.Agr.Sc., Director of Agriculture, at the 39th Annual Convention of the Chamber of Agriculture at Bairnsdale, April, 1941

SINCE I addressed you in March last year at Wangaratta on the subject of Wartime Agriculture, we have been confronted with the greatest crisis that agriculture in this country has ever known, not excepting that of the last war or that which occurred during the great financial slump beginning in 1929.

The crisis is due to the loss of shipping by enemy action reaching such proportions that the British Government has been forced to divert most of her food ships to countries bordering on the Atlantic Ocean: that is to say, to ports where the distances from Britain are such that the ships can make three or four trips for every one they could make to Australia.

And so, despite the urgent need of food in Britain and the abundant supplies of it that are coming into existence in Australia, a gap of 12,000 miles of ocean separates the food from the people who would eat it.

On the other hand, the bounteous stocks of produce accumulating in this country create a most difficult financial problem for producers and governments. Nor can Britain afford, as in the last war, to purchase our produce (except wool) and allow it to accumulate in mountainous quantities on these shores for an indefinite period, running up storage costs and steadily depreciating in value. Nor does it seem likely that the position will be relieved in the near future.

Not only must the Atlantic battle be won, but the rate of building new ships in the Empire and in the United States of America must be accelerated until the tonnage launched is sufficient to overtake the losses and provide a surplus sufficient to enable the normal trade routes to be reverted to.

By November, 1939, contracts for the sale of wool, meat, butter, cheese, eggs, canned fruits and dried fruits, worth £102,000,000 had been concluded with the British Government at prices which were a shade better than those current at the time.

There was some disappointment that better prices had not been obtained, but sober reflection brought a feeling of relief to those sections of primary producers who had been conducting their industries for years under the shadow of impending export restrictions, due to the glutting of the British market by ever increasing quantities of primary produce from across the seas.

Woolgrowers, who had sold their produce for the duration of the war and one year after, too, felt that they had been afforded breathing space from the menacing competition from cheap substitute fibres.

Except in the case of wool, the November contracts were for one year and for fixed quantities, delivered f.o.b. but this short term aspect of the contracts, although referred to by the Minister for Commerce in the Federal Parliament received little other notice. At all events, it was not regarded as carrying any hint that the contracts might not be renewed from year to year on similar terms.

Reports that the people of Britain were to be rationed caused many Australians to feel that we ought to make an organized effort to raise more produce of the kinds and in the quantities required by Britain, and there emerged a widely publicized demand for a "lead" by the Governments as to the direction this effort should take.

Naturally, that "lead" could only come from the buyer of the produce, Great Britain, but for a long period no "lead" was forthcoming, despite several pressing requests. Eventually, the Ministry of Food furnished a statement setting out the order of priority for the shipment of its requirements of primary produce from this country. It indicated that butter, cheese, dried and condensed milk, eggs and pigmeat would be given priority in the allocation of shipping space. Flax also was urgently needed. The position of lamb and mutton, and beef, was not then clear, and canned fruits and wine were low on the list. These changed requirements, although somewhat unsettling, were nevertheless authoritative and had to be accepted as the "lead" required. The Commonwealth Government communicated them to the States, and Departments of Agriculture brought them to the attention of primary producers throughout Australia, and endeavoured to stimulate production in the direction desired. Since then, heavy cuts in the quality of meat which the Ministry of Food hoped to be able to lift from Australia have been announced, including a complete prohibition after March last of the export to Britain of pig carcasses of bacon weight. Eggs in shell are not wanted. Dried egg products that we are not yet in a position to manufacture are requested, there is increased demand for canned meat, and shipping space is now being found for quantities of canned fruit. What the future holds for all these products and for butter and cheese we do not know.

These drastic reductions and alterations in the quantity and kind of primary produce that can be exported from this country, and the steps that have been taken by the Commonwealth Government to prevent a wholesale collapse of prices in Australia, have come upon us so suddenly that everywhere producers are confused and apprehensive as to the future.

This state of mind is unhealthy and is apt to induce a hostile reaction in those whose long-established interests, practices and methods have been so violently disturbed. Much of it can be dispelled by a proper understanding of the nature of the problems that have to be faced and such an understanding might be productive of sound criticism by the people most affected, without which the regulation of primary industry on the scale that has been undertaken by the Commonwealth Government can never be the best that can be devised.

The problem in the case of apples is to fit an average Australian crop of 11 to 12 million cases into a local market with a normal absorptive capacity of about 6 million cases. Local consumption can be stepped up by a combination of advertising, salesmanship, and good value, but obviously it cannot be increased to the extent of nearly doubling consumption by a heavily taxed community of a luxury article in time of war. The whole of the fruit has been acquired by the Commonwealth Government and price schedules arranged for each State in accordance with variety, grade and size. Much of the fruit in the States and districts remote from the principal markets, is being paid for at the rates scheduled for it after assessing the yield, before picking time in the orchard. Such fruit will not be marketed and as it is not picked, boxed, transported and stored, the least loss will be incurred on it. What low grade fruit can be used for by-products is being processed. It is clear that in a good season much fruit must remain unmarketed, and, despite some gifts to the poor, will be wasted. This is an aspect of the scheme which, as it conflicts with natural instincts, tends to outrage popular feeling and is seized upon by opponents as evidence of inefficiency, but it is a basic principle of the plan.

For some years before the war, wheat was suffering from a glut in the exporting countries, and the British Government in the early months of the war indicated that it could not buy our surplus, nor could it provide sufficient ships to enable us to market it.

The Commonwealth Government set up a compulsory Australian Wheat Pool and furnished a guarantee that the pool would return growers 3s. 10d. a bushel f.o.b. port for each bushel received into the pool up to a maximum of 140 million bushels, but if, in any year, more wheat is received into the pool than 140 million bushels, the excess will not be subject to the guarantee. From this, it follows that if the excess realizes less than 3s. 10d. net per bushel, it will dilute the payment made proportionately.

In order to prevent any expansion of the acreage sown and to enable the acreage to be reduced if deemed advisable, the Commonwealth Government has decided to licence each wheat farmer and to register (i.e.) licence each wheat farm as well.

A convoy on its way to Britain. [Dept. of Information Photo.

Each licence issued is subject to the licensee agreeing to such measure of acreage control and method of disposal of the crop (including the cutting of it for hay) as the Minister of Commerce may determine. In the event of the price per bushel payable to growers by the Australian Wheat Board exceeding in any year 3s. 10d., 50 per cent. of such increase will be retained by the Commonwealth Government in order to build up a fund to recoup any loss previously incurred in providing the guarantee, or, alternatively, that may be incurred at some future time. In this way, the price of wheat has been stabilized by the Commonwealth Government, but, in consideration for the stabilization, wheatgrowers have surrendered liberty of action as to the acreage of wheat that each may sow and harvest for grain, or cut for hay, as well as all claim to 50 per cent. of any increased price over 3s. 10d. should wheat reach higher prices in the future.

Once wheat farms are licensed it is competent for the administration in the future to refuse to issue wheat licences in respect of any additional land not originally licensed, thus making wheat growing on the existing wheat farms a closed preserve to the properties originally licensed. The personal licences are specific to the persons named, they could be restricted to the number originally granted, reduced in number from time to time, or the number could be increased.

In the case of meat, the surplus resulting from the serious reduction in the quantity that may be exported would have resulted in glutting the Australian market during the coming export season and in forcing down prices to unpayable levels unless effective preventive measures were taken.

Considerable additions to the cool store space for meat have been arranged at the export meat works and at the Government Cool Stores. This will enable a three months' hold-up of refrigerated ships to be endured if it occurred at the peak period for slaughtering. But of course you cannot continue indefinitely to store meat without reaching a position when the cost of storage, loss by depreciation of the product, and other costs have eaten up most of its value, and when its very presence tends to reduce the value of your new season's product.

The Commonwealth Government has prohibited the storage for export of summer lambs for the period 21st April to July 31st. This has been done in order to utilize any refrigerated ships for clearing the cool stores before the next lamb season.

The Commonwealth Government has announced that if the prices in the market weaken during that period, they will stabilize the market by buying at a fixed price, which, so far, has not been made known. They will also subsidize the canning

of mutton if that becomes necessary. There also will be increased canning of beef, which is in strong demand for Army use.

When the lamb export season opens, the Commonwealth Government has agreed to pay a fixed price for lamb in order to stabilize the market, but at a somewhat lower level than the price agreed to be paid by the British Government in its first contract. The object of this step is to stimulate consumption of lamb in Australia, and so reduce the lamb surplus to manageable proportions.

I do not presume to catalogue in detail all the restrictive legislative and administrative steps that have been taken by the Commonwealth Government to preserve from chaos those primary industries whose stability depends on the free movement away from these shores of the surplus stocks in excess of Australian consumption. Nor do I intend to join in the chorus of criticism to which I have referred. I take the view that while the export industries are sick, it is better to take the medicine that the doctor prescribes, although the taste may be bitter; otherwise the patient may get even worse.

For the time being, war has produced a sudden breakdown in the overseas transport system on which we have relied to clear our export surpluses since settlement began. The breakdown of such a vital link in our Empire communications must result in a violent disturbance of our normal marketing methods. That chaos has not occurred is due to the stabilizing measures taken. The personal loss and interference with individual liberty that these measures cause, irksome as they are, are small compared to what would have taken place had effective steps not been taken.

From the point of view of the Department of Agriculture, which has played its part in promoting the adoption of the most efficient methods of production throughout this State, there is one aspect of these restrictive methods to which I feel I should direct attention, and it is this—For the first time in the history of Australian primary export industries, the better the season, the greater the yield per acre, the more prolific our animals, the less disease affects the crop or the animal, the more efficient our productive methods, the greater becomes our marketing problem. This is a situation with many serious implications, and not the least important of these is the adverse influence that these wasted surpluses may have on the average level of farm efficiency throughout Australia. Heaps of apples rotting in the orchard, unwanted wheat, unsaleable eggs and wine, an embarrassing surplus of lambs, all seem to make a mockery of technical skill and painstaking care in primary production. It would be deplorable if we were to give way to that feeling and emerge from our present troubles at the end of the war less competent to face world competition in the overseas markets than we were at the beginning. Rather should we make every effort to overhaul the national production machine and bring it up to the best possible condition for a long and continuous trouble-free run after the war. Let us make a virtue of necessity.

An opportunity exists during the restrictive period for the restoration of depleted soil fertility by resting overworked paddocks and the adoption of sounder crop rotation. Drift and soil erosion might well be attended to and adequate fodder reserves set aside.

Many sheep flocks could be built up to a higher state of efficiency by culling aged and off-type ewes and by replacing them with good-framed young sheep carrying better fleeces. Such a course would help to relieve the surplus and build up the quality of the flocks. Unfortunately, the very men who are most in need of effecting these improvements are those whose financial position makes it most difficult. This is an aspect for

Australian-grown tobacco will conserve dollar exchange.

the consideration of Governments and for the financial institutions concerned.

But the war has not been wholly repressive of our agriculture, for, in the case of flax and tobacco, increased production has been specially requested.

There is also the question of secondary industries utilizing surplus raw materials which the war has shown the desirability of establishing and maintaining in Australia. Flax is used for the manufacture of soft twines, including sewing twines for leather goods such as boots, soft cordage used by the Navy, parachute webbing, fire hoses, and many other articles. For many years, Australian twine manufacturers preferred to import their flax or flax substitutes such as Italian hemp. The cessation of these latter supplies, following the imposition of economic sanctions on Italy some years ago, however, converted some of them to the point of view that it would be wise to encourage flax production in Australia. Once there was bona fide intention of Australian flax manufacturers to regularly purchase Australian flax, the way was open for the steady expansion of the industry.

Harvesting flax in Victoria.

Australian manufacturers at present require the produce of 7,000 to 8,000 acres. The area sown to flax in this State, long stationary at two or three hundred acres, rose to 2,000 acres in 1939, and last year 8,000 acres were planted for local use and a further 4,000 acres for the British Government. Some splendid crops were grown but, owing to the late delivery of the seed from England, a proportion of the area was sown so late that it failed.

The Empire needs more flax.

This year a minimum area of 28,000 acres is required and the following areas have been tentatively allocated in the various districts:—

	Acres.	*Acres.*
Hamilton	5,000	
Ballarat (Wendouree) ..	4,000	
Colac	2,500	
Kooweerup (including Leongatha)	3,000	
Drouin	2,000	
Myrtleford	2,500	
		19,000
Districts where there are no mills:—		
Riddell, Gisborne, Romsey	4,000	
Sale, Maffra, Lindenow ..	2,000	
Camperdown, Terang, Warrnambool	3,000	
		9,000
		28,000

This year, the price to be paid for flax of standard quality will be £5 15s. a ton. I wish to urge farmers in suitable areas to respond to the appeal made for the flax, most of which is urgently required by the British Government for war purposes.

Tobacco is a crop that it has been decided to stimulate in Australia with a view to relieving the exchange position. It is another instance where, for many years, manufacturers preferred to import their requirements rather than grow them in this country.

During the past few years that attitude has been partially relaxed and an earnest endeavour is being made to expand the industry in Australia. So far as our own State is concerned, it is on the southern limit of the latitudes most favorable to the growth of the tobacco plant. In this State, the disease Blue Mould attacks the crop rather severely in the field and fairly persistently, and now and then early frosts injure the crop. Since the boom year of 1932–33 when, under the stimulation policy of the Federal Government, 13,418 acres were sown, the acreage sown has steadily declined in Victoria, until last year it reached only 2,000 acres.

This shows that under the scale of prices prevailing, production was not very profitable in Victoria. In the meantime, steady expansion took place in Queensland, West Australia and latterly in New South Wales, where soil and climatic conditions on the whole are more satisfactory.

Recently the manufacturers agreed to increase prices by 25 per cent. Under this stimulus, it should be possible in Victoria to bring about a 50 per cent. expansion of the present acreage fairly rapidly, but no important expansion is believed practicable in this State at the prices likely to be received. Tobacco-growing is a highly technical industry and only those thoroughly experienced are likely to make a success of it.

I have referred to the possibility of establishing secondary industries that would assist in absorbing some of our primary products.

One of them is the manufacture of alcohol from wheat. On the one hand, restrictive action is being taken to prevent wheat surpluses becoming unmanageable, and, on the other, there is a possibility of this country running short of high-grade motor spirit. Wheat can be changed into alcohol, which, when blended 1 in 6 with second grade motor spirit, converts it into first grade spirit, and so at once adds to the volume of motor spirit available and renders the product more effective. The only question at issue is the economic one. Is it a practical business proposition? The complete answer to that is known only to the Commonwealth Government which has not yet made public the report of its latest investigations. Previously published reports of official investigations show that a price not very much below that which has been guaranteed wheat growers could be paid for surplus wheat without increasing the present price of first grade motor spirit, provided that the Government was willing to forego the duty (11½d. per gallon) on such imported spirit as would be replaced by the power alcohol. This would be a heavy burden on the Government and there is the responsibility for either guaranteeing private enterprise manufacturing alcohol, against loss, if wheat prices rise later, or alternatively of accepting the responsibility for loss if it undertakes the manufacture through a government instrumentality.

The advisability of manufacturing alcohol in this country from suitable primary products must have convinced the Commonwealth Government that these burdens should be shouldered, because it has announced that a plant to convert wheat to alcohol will be erected in West Australia where there is little local demand for wheat and a surplus is on hand. Further plants may be erected in other States later.

I will conclude with a reference to the building of ships which the Commonwealth Government now says it intends to start, and which is vital to our export trade.

Twice in 25 years we have been plunged into a first class agricultural crisis because we have no ships; we have no overseas mercantile marine; we do not own overseas ships and we do not build them, nor do we build those owned in Australia that ply around our coasts. From this and other considerations it is obvious that we cannot build ships as cheaply as they can be built overseas. How near we could get to producing them at a competitive price if we standardized our coastal types and required them to be built in Australia, I do not know. I would hazard a lay opinion, however, that only by such means would it be possible to establish the ship-building industry permanently in this country, reduce the cost per ton to the minimum, and be in a position to expand the industry quickly to meet a sudden emergency such as the present.

Launching an Australian-built ship. [Dept. of Information Photo.

Potato Seed Certification

Certified potato seed is seed that has been certified by the Department of Agriculture as complying with certain standards as to purity of stock and freedom from diseases.

The standards set are high. In the case of purity practically 100 per cent. is aimed at and only an extremely low percentage of disease is allowed. It is impossible of course to give a warranty of absolute freedom from disease as certain diseases, such as the viruses, may be present in a crop to a slight degree without showing any symptoms in the foliage.

All crops certified are subjected to three examinations—two during the growing period and one after harvesting and grading has been completed.

If at the first inspection too high a percentage of disease is showing, the crop affected is barred from certification. If, however, only moderate infestation is in evidence, the grower is shown typical affected plants and advised to "rogue" same as soon as possible to prevent further contamination. At the second examination a check on such rogueing and any further elimination, if necessary, is advised.

The final inspection is made when the crop is bagged. The bags are then tagged and sealed if the contents conform to a sufficiently high standard of grading.

Flax and the War

AN APPEAL TO VICTORIAN FARMERS

A STRONG appeal to Victorian farmers to assist in the Empire's war effort by growing flax was made by the Minister of Agriculture, Mr. E. J. Hogan, M.L.A., in an address delivered to a meeting of farmers in the Buninyong Shire Hall on Thursday, 22nd May.

Mr. Hogan pointed out that some Australians failed to realize how seriously we would be affected if Britain were defeated and we were attacked by Hitler's mechanized forces. There was too much complacency in Australia about the war, and with our feeble efforts on the home front.

Hitler's invasion and conquest of Poland, Denmark, Norway, Holland, Belgium, France, Jugoslavia, and Greece, and the ruthless way his air force had bombed peoples' homes and killed women and children were an example of how he would treat us if he defeated Great Britain and invaded Australia.

While the Germans were working day and night making planes, tanks, and artillery, many Australians were doing nothing, while others were agitating for shorter hours and higher wages and promoting strikes.

"We will not maintain our industrial standards or enjoy our social services if we are defeated," Mr. Hogan continued. "Any one who thinks Hitler would treat us better than he is treating the Poles is very foolish. The A.I.F. and R.A.A.F. deserve our wholehearted support. They must be supplied with planes, tanks, and artillery. We should work willingly to arm them as well as the German people have armed their forces. If we do that we will help to save ourselves from what has happened to Poland, Belgium, France, and Greece."

Continuing, the Minister declared that everyone should help because the personal security and property of everyone was in danger and would be lost if we were defeated. Some people were not doing anything to help because they believed we would win somehow, and that there was no necessity for them to do anything. Such people might get a rude awakening, when it would be too late for them to do anything.

Other people acted as if the war were an entertainment—parades to watch, bands to hear, news to read, wireless to listen to, strategy to criticize, but no need for them to do anything. They were like spectators at a football match, of no help to either side.

"We should do all we can to prevent the calamity that befell Poland occurring here. The Poles were evicted from their homes and dispossessed of their property and made to work for the conqueror for nothing," went on the Minister, "We should each ask ourselves, 'Can I do anything to avoid this appalling danger? Can I do anything to avert defeat?'

"If we can prevent it by working harder, better, and longer, we will be fortunate, and we will be envied by the nations Hitler has conquered and enslaved.

"A patriotic, courageous, articulate, public opinion will attain an energetic effort in our armament works, aeroplane factories, and shipyards. We should launch a public crusade to ensure that energetic effort."

"People who want a better and quicker production of armaments for our men who volunteered should speak up," Mr. Hogan continued. He asked farmers to give a good example and work harder and longer and plant a maximum area with flax.

This campaign to grow flax was part of the war effort. Supplies of flax to Britain had been cut off by the German occupation of France and the Netherlands, and the impossibility of obtaining flax from Russia and the Baltic States.

Britain normally grew about 12,000 tons and imported 60,000 tons of flax.

Flax was required in the construction of aeroplanes and the seaming twines which are an essential part of a soldier's equipment, canvas goods, fire hoses for A.R.P. work, and tarpaulins, rope, and cordage.

Farmers who were willing to grow flax and help in this important war effort could obtain application forms at the meeting or from the Department of Agriculture, and apply for seed. As soon as the land was approved by Departmental officers flax seed would be forwarded to farmers by the Department of Agriculture. He appealed to Victorian farmers to plant to flax the 28,000 acres required by the British Government, and so to refute Senator McBride's criticism of Victorian farmers. On national grounds alone, there was every reason to believe that farmers would respond willingly and quickly to the appeal. In fact, many of them already had—22,000 acres having been booked in Victoria up to 21st May. But flax was also an attractive proposition from the economic point of view. At the present time the market for a great number of Victoria's staple products was threatened by our inability to obtain shipping space. As far as meat, grains, and dairy products were concerned the farmer was gambling not only on the season but on price as well, and in some cases the odds were not very attractive.

With flax the farmer knew exactly what price per ton he would obtain for a standard article. (The price for standard flax delivered to the nearest mill is £5 15s. per ton, but bonuses payable for superior quality straw may enable the good farmer who experiences favorable seasonal conditions to obtain as much as £7 5s. per ton.) He should know, too, that it is reasonable to expect a yield of 1½ tons per acre, while in a good season, 2-ton crops may be harvested.

"Victoria," concluded Mr. Hogan, "is still 6,000 acres short of its allotted quota of 28,000 acres. That 6,000 acres for flax is required urgently, especially from farmers in the Ballarat, Traralgon, Sale, Maffra, Camperdown, Terang, Warrnambool, Wallan, Donnybrook, Drouin, Warragul, Myrtleford, and Wangaratta districts. By growing flax now you will be helping to win the war and at the same time you will establish your right to participate in what will become a permanent major Victorian industry."

Harvesting flax at Birregurra.

Pasture Plants of Victoria

2. The Canary Grasses (Genus Phalaris)

By W. D. ANDREW, M.Agr.Sc., Assistant Agrostologist

This is the second of a series of articles to be presented in simple form to enable members of Young Farmers' Clubs and others to obtain an elementary knowledge of the pasture plants of Victoria. The first article of the series was published in the February issue of this journal and dealt with the rye grasses. The meanings of botanical terms not fully explained in the text will be found at the conclusion of this article. For descriptive illustrations of these terms reference should be made to article No. 1 of the series.

OF the six species of Phalaris recorded for Victoria, Toowoomba grass (*Phalaris tuberosa*) is the only one cultivated to any extent as a pasture grass.

Canary grass (*Phalaris canariensis*) is sown in some places for the production of bird seed. Lesser Canary grass (*Phalaris minor*) is a very common weed on cultivated land and the other three species are as yet relatively unimportant in this State.

Toowoomba or Harding Grass (Phalaris tuberosa, L.).

History and Nomenclature.—It is not certain how this perennial grass was introduced into Australia, but it is thought that the seed was originally sent from Italy, via America, to the Botanic Gardens at Toowoomba, Queensland, in 1883.

In the past, there has been some confusion with regard to its nomenclature, as it has been referred to by various botanists as *Phalaris stenoptera* (Häckel), and *Phalaris bulbosa* (L.), but *Phalaris tuberosa* (L.) is now the generally accepted name. The name *Phalaris commutata* also has been used. Some authorities consider that *Phalaris stenoptera* (Häckel) is a hybrid of *Phalaris tuberosa* and *Phalaris minor*.

Agricultural Features.—Toowoomba grass, or "Phalaris" as it is commonly referred to in Victoria, is a perennial species which will persist under an annual rainfall as low as 14 inches, although it is not usually recommended for such dry conditions.

Toowoomba grass (Phalaris tuberosa, L.).—Note the long cylindrical head; portion of perennial rootstock and transparent ligule at the junction of leaf and stem.

[After Breakwell.

In addition to being drought resistant, it can withstand very wet conditions—even complete submergence for weeks at a time.

Excepting the dry months of January and February, this grass makes active growth throughout the year, although its winter production is somewhat restricted by low temperatures.

"Phalaris" can be grown on a wide range of soil types, and appears to be particularly well suited to the heavy black soils and the self-mulching, deep red volcanic loams. It will grow satisfactorily on light sandy country provided there is a retentive clay subsoil within about 12 inches of the surface.

In sowing "Phalaris," autumn seeding on a well-prepared seed bed is recommended. If conditions are favorable, germination usually commences three to four days after sowing, which should be undertaken early in the autumn to allow the plants to have an opportunity to become well established before the winter growing weeds develop. Should heavy rain fall immediately after sowing and the ground become very wet, a poor strike usually results, as the seed does not germinate satisfactorily under these conditions.

With a favorable sowing, about one-half of the germinable seed sown produces mature plants, so that a seeding of 1 lb. per acre should produce a stand having two to four plants per square foot.

Toowoomba grass is a slow starter at the best of times, and farmers often think it has failed because of its poor showing in the first year. But, once established, the plants enlarge laterally each year by means of short rhizomes (underground stems).

In a newly-established pasture of "Phalaris" it is a good plan to allow seeding to take place to thicken up the stand.

Lenient grazing during October has a beneficial effect, as at this time of the year the plants are susceptible to damage by heavy defoliation and can be weakened to such an extent that they might be rendered incapable of withstanding a very dry summer.

Toowoomba grass normally commences flowering early in November, after which it becomes very stemmy and unpalatable. Even when it is in the young stage some stock leave it in preference to other pasture species.

An association with a leguminous plant is necessary for the "Phalaris" to develop satis-

Outer glumes of (a) P. arundinacea. (b) P. tuberosa. (c) P. coerulescens. (d) P. minor. (e) P. canariensis. "Seeds" of (f) P. arundinacea. (g) and (h) P. tuberosa. (j) P. minor. (k) P. coerulescens. (l) P. canariensis. (m) P. minor.—Note the difference between the size of the seeds and the length of the sterile glumes.

[After H. H. Allan, Grasses of N.Z.

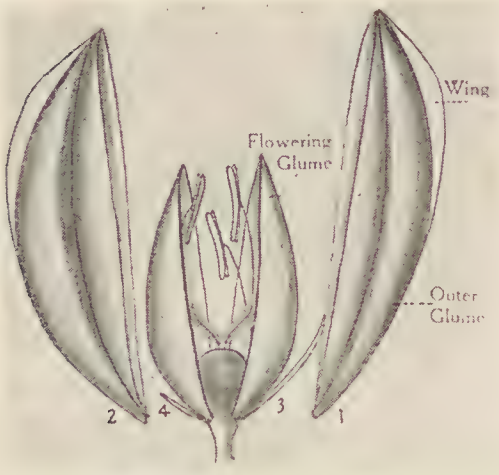

Diagram of a spikelet of Phalaris tuberosa showing outer glumes 1 and 2; sterile glumes 3 and 4, and flowering glumes enclosing three stamens and ovary. (Outer glumes have been detached for clarity.)

factorily, and subterranean clover (*Trifolium subterraneum*) is the species most commonly used.

Red Clover (*Trifolium pratense*) grows very well with "Phalaris" on the heavy black soils, under good rainfall conditions.

It is not wise to sow lucerne (*Medicago sativa*) with "Phalaris" in places where soil moisture is very restricted during the summer time, as lucerne usually takes most of the available moisture during the dry period, and many of the "Phalaris" plants die from drought.

Associations of perennial rye grass (*Lolium perenne*) and "Phalaris" are not very satisfactory, owing to the aggressive nature of the rye grass and the relatively slow development of the "Phalaris" in the seeding year. In places where such combinations are grown it is usual to find the "Phalaris" making very much poorer growth than when sown only with subterranean clover. Where the rainfall and soil type are such that perennial rye grass grows vigorously, it is unlikely that there would be any gain by replacing the rye grass with *Phalaris tuberosa,* but it can be sown with advantage on very heavy soils, on poorly-drained country, or where the rainfall is not quite sufficient to maintain perennial rye grass.

Harvesting the Seed.—The yield of seed varies greatly with seasonal conditions, and 100 lb. per acre would be considered very satisfactory. A pound contains approximately 350,000 seeds.

Harvesting is difficult, as the heads do not all appear together, ripen unevenly, and the seed is shed very readily.

If a reaper and binder is used, cutting may be commenced when the seeds are shedding at the tip of the head, whereas stripping would be carried out at a later stage of maturity, in which condition there is a great danger of losing seed by shedding.

To prevent loss of seed during reaping, it is usual to modify the binder to catch the seed that is shed while the mown herbage is passing through the machine.

A method sometimes advocated is to build a low wall of canvas around the bottom platform and to stretch similar material on the vanes of the beater.

Small trays are arranged at various places on the binder where seed normally collects or drops off the machine, such as on the knotting table, at the turn of the canvas, &c.

Sheaves must be handled with care to prevent loss of seed. Some farmers place them on tarpaulins to cure, and line their wagons to catch any seed that is shed during carting.

The alternative method of stripping the seed with a harvester produces a cleaner sample, but more seed is lost during harvesting. The sample also may contain a high percentage of immature seed if the operator is inexperienced. In using an ordinary wheat harvester it is necessary to use a special riddle and work with the blast reduced. Whichever method of harvesting is used, it is necessary, before the seed is sold for sowing, to have it finally cleaned to comply with the requirements of the Seeds Act.

Identification.—The leaves of *Phalaris tuberosa* are hairless (glabrous), 12 to 18 inches long, bluish-green in colour, and vary in width from about one-quarter to one-half an inch. In the young stage they are rolled.

The ligule is about ½ inch long, rounded at the top and transparent. The stem is more or less swollen at the base, and if cut through it exudes a pinkish sap.

Ungrazed plants would normally reach a height of 2 to 3 feet, and under very favorable conditions may grow as high as 7 feet.

The inflorescence (flowering head) is borne on a long stalk (peduncle) and resembles a spike. Actually the spikelets are on short stalks (pedicels) and the type of inflorescence is correctly termed a panicle.

Spikelets of the "Phalaris" species contain a single fertile floret consisting of two tough

shiny flowering glumes enclosing an ovary and stamens. At the base of these flowering glumes or pales there are two small sterile glumes, which are not readily seen until the outer glumes are removed. The floret may therefore be said to have four outer glumes, and this is a characteristic feature of the *Phalaris* Genus.

In Toowoomba grass, the outer glumes of the spikelets are boat-shaped, about equal in length, and the keel is prominent.

After fertilization, which is mainly by cross pollination, the seed which develops remains encased by the two leathery flowering glumes, and when it is shed it still has the small sterile glumes attached to its base. These remain on most of the seeds even after cleaning. If examined carefully with a low-power lens it will be seen that one sterile glume is very small, and the other about one-third the length of the seed. With high magnification one can see a small appendage on each of the sterile glumes, which indicates that they are really sterile florets, each consisting of two empty rudimentary flowering glumes.

The seeds vary in colour from yellow-brown to light-brown, and when germinated on wet filter paper the tips of most of the rootlets are greenish-white. This distinguishes them from seeds of *Phalaris minor*.

Canary Grass (Phalaris canariensis, L.). The short oval head and the relatively long sterile glumes are characteristic features of this species. [After Hitchcock.

Canary Grass (Phalaris canariensis, L.).

Canary grass is an annual, which is a native of Europe, Asia, and Africa. It is widely spread in Victoria. Although of some fodder value it is not cultivated in this State as a pasture grass, but in certain districts it is sown for bird seed.

Canary grass requires conditions similar to those necessary for growing a cereal crop. Good soil is essential for satisfactory growth, but after one crop the prospects of good yields are so poor that it becomes necessary to move on to a new paddock.

For seed production, an autumn sowing of 10 to 15 lb. per acre on fallowed land is recommended. The ground must be well prepared and free of weeds, as this grass is sensitive to competition during the autumn and winter. Most farmers mix the seed and superphosphate together and sow through the manure runs, but an alternative method is to use a grass seed attachment on the drill.

From one-half to one hundredweight of superphosphate per acre is a suitable rate of manuring for the production of seed.

The plants usually make slow growth in the early part of the year, but if favorable growing weather prevails in the late winter the paddock could be stocked, if grazed off rapidly, without seriously affecting the yield of seed.

Canary grass generally attains a height of 2 to 3 feet and is ready for harvesting about December. The method of handling is similar to the harvesting of *Phalaris tuberosa,* but yields are much better, and the seed is not shed as readily. Yields of up to 5 cwt. of seed per acre have been obtained, but an average would be about 300 lb.

Identification.—In the vegetative condition the plant is not unlike *Phalaris tuberosa.* Its leaves and ligule are similar in appearance, but the foliage is more open and stemmy. Being annual in character, the root system is much less extensive than Toowoomba grass, and the plants can be easily pulled out by hand when the ground is soft.

The base of the stem is not swollen as in some of the other "Phalaris" species, but on

Lesser Canary Grass (Phalaris minor Retz.). The heads resemble those of Toowoomba grass, but the leaves are generally shorter.
[After Breakwell.

being cut through it shows the pinkish sap characteristic of the genus. When the squat oval heads appear, identification is relatively simple.

The outer glumes of the spikelet are conspicuously winged and are prominently marked with deep-green lines. The two sterile glumes attached to the base of the floret are relatively large and conspicuous, being about half as long as the pales, which distinguish *Phalaris canariensis* from all the other species of "Phalaris" recorded for Victoria.

Lesser Canary Grass (Phalaris minor, Retz.).

Lesser Canary Grass is a common annual weed grass on cultivated land. It produces a fair yield of succulent foliage during the winter and early spring, but is not sufficiently productive to warrant its cultivation as a pasture grass.

It is similar in general appearance to ordinary canary grass, but the head is elongated and resembles the head of *Phalaris tuberosa*, although usually a little shorter, and at maturity it droops over.

The leaf sheaf from which the head emerges has an inflated appearance and the leaves usually are shorter than *Phalaris tuberosa*. The ligule is similar to Toowoomba grass. Stems are thin and tinged with purple at the base, and frequently form elbows near the ground. Young roots often are red at the tips.

Flowering glumes have a narrow wing on the mid-rib and are striped, but not so conspicuously as those of *Phalaris canariensis*.

The spikelet has one sterile glume reduced to a minute scale without an appendage, while the other sterile glume is small and has a tiny appendage. The seeds are dark brown-grey in colour and are smaller than those of *Phalaris*

Phalaris species.—Heads of (a) P. arundinacea. (b) P. tuberosa. (c) P. minor. (d) P. coerulescens. (e) P. canariensis. Base of plant of (f) P. tuberosa. (g) P. minor.
[After H. H. Allan, Grasses of N.Z.

tuberosa, and in contrast with this species when they are germinated on wet filter paper they produce rootlets which show a pink colouration on the tips.

Reed Canary Grass (Phalaris arundinacea, L.).

A variegated form of this grass (Var. *picta*) known as "Gardeners' garter" or "Ribbon grass" has been grown for decorative purposes

Reed Canary Grass (Phalaris arundinacea L.). Note the open nature of the inflorescence and the broad leaves.

in Victorian gardens for a number of years, but so far Reed Canary grass has not become important agriculturally in this State.

As its vernacular name suggests, it is a coarse, tall-growing grass suitable for wet conditions. The leaf of this perennial species is up to an inch wide at the broadest part, and the plant spreads by rhizomes and stolons (surface rooting stems). In contrast to the other species of "Phalaris" it is winter dormant, susceptible to frost injury and makes its maximum growth during the summer time. Its ligule is up to ¼-inch in length, being generally a little shorter than that of *Phalaris tuberosa* and the bases of the stems are not swollen.

The seeding heads are more open than those of the other species of "Phalaris," and this makes identification easy when the inflorescence appears.

There is practically no wing on the mid-rib of the outer glumes, and the sterile glumes are reduced to narrow, hairy tufts about one-third of the length of the flowering glumes.

The seeds are usually dark in colour and are more egg-shaped than the seeds of the other perennial species of "Phalaris" described in this article. There are approximately 550,000 seeds to the pound.

Blue Canary Grass (Phalaris coerulescens, Desf.).

A perennial species native to the Mediterranean region, having a growing period corresponding to *Phalaris tuberosa,* but maturing earlier in the spring.

In its habit of growth the plant is rather open. The leaves are relatively narrow, of a dark bluish-green colour, and the foliage is stemmier and tougher than Toowoomba grass.

Stems are purplish and swollen at the base, and the ligule is long and transparent.

Blue Canary grass is supposed to be more drought-resistant than any of the other perennial species of "Phalaris" found in Victoria, but up to the present no comparative trials have been carried out in the drier districts of this State.

It produces seeding heads about October, corresponding in this regard to *Phalaris canariensis* and *Phalaris minor,* but the yield of seed is usually poor.

The flowering heads are somewhat similar in appearance to those of *Phalaris tuberosa* but are shorter and have a more pronounced purplish tinge. Outer glumes of the spikelets have prominent green stripes, and the wing on the mid-rib generally has a jagged edge. The pales are shiny and hairless, and the sterile glumes are reduced to minute scales.

Bristle-spiked Canary Grass (Phalaris paradoxa, Willd.).

This annual introduced species is of little agricultural importance and is not common in this State.

The foliage is stemmy and rather rough to the touch. Leaves are up to ¼ inch in width and 6 inches in length. The ligule is transparent, blunt, and about ¼-inch long.

Bristle-spiked Canary Grass (Phalaris paradoxa, Willd.). Note the bristly appearance of the head, and the curious shape of the outer glumes. (a) A sterile spikelet. (b) A fertile spikelet. [After Hitchcock.

Phalaris paradoxa flowers about November, and produces a cylindrical spike-like head, often tipped with purple. It closely resembles *Phalaris coerulescens* on cursory inspection.

The feathery appearance of the inflorescence due to the overlapping of the curiously-shaped outer glumes is characteristic of Bristle-spiked Canary grass. This species differs from all of the other Victorian members of the "Phalaris" genus in that the fertile spikelet is usually surrounded by about six sterile spikelets, each consisting of outer glumes and usually an empty flowering glume.

When the head is mature the fertile spikelet falls with the sterile spikelets attached.

If a fertile spikelet is closely examined with a low-power lens, two small scales can be seen at the base of the flowering glumes. These are the rudimentary sterile glumes.

At first glance the seed could be mistaken for the seed of Toowoomba grass, but it can be distinguished by the shortness of the sterile glumes and the almost complete absence of hairs on the shiny flowering glumes.

Glossary of Botanical Terms.

Floret.—The flower of a grass plant. When complete it consists of two flowering glumes or pales enclosing an ovary and stamens.

Ligule.—A small membrane commonly found at the junction of the leaf and stem of grass plants. It is sometimes reduced to a semi-circle of hairs.

Seed.—After fertilization the ovule in the ovary develops into a seed. In most grasses this remains permanently encased by the flowering glumes.

Spike.—A type of inflorescence which has stalkless flowers borne on a central stem or "rachis".

Spikelet.—A group or a single flower shielded by one or more bracts or "outer glumes".

Sterile floret.—A floret which does not contain an ovary, and therefore cannot bear a seed.

Lice on Poultry

Lice, of which there are various kinds on fowls, cause itching and irritation which bring about general restlessness and interfere with growth, development and egg production.

Good results in eradication can be obtained by the use of commercial sodium fluoride. Hold the bird on a table and apply a pinch next to the skin under the feathers, a pinch under the head, one on the neck, two on the back, one on the breast, one pinch below the vent and on the tail, and one on each thigh and on the underside of each wing.

An easier but not such an effective method can be used by mixing three parts of flour with one part of sodium fluoride, and dusting the bird thoroughly with a powder blower.

Another method of eradication is to choose a calm night and apply a fine trickle of nicotine sulphate 40 per cent. along the centre of the perches before the birds go to roost. A very small amount of this material must be used, however. The warmth of the birds causes the fumes to rise and penetrate the feathers. As the eggs are not destroyed by the fumes, this treatment should be repeated once a week for three weeks to kill all the lice as they hatch out.

Dust baths containing some tobacco dust or insect powders may be used also, but are not so effective as the individual treatment of the lice-infested birds.

Blowfly Strike in Sheep

THE Council for Scientific and Industrial Research has supplied a preprint from its *Journal* for May, 1941, which affords some very useful information for sheep owners in regard to the latest work on blowfly strike.

A large proportion of the sheep blowfly research in this country has dealt with the problem of preventing blowfly strike. Selection and breeding, the Mules operation, jetting, crutching, and the use of fly repellents all have been advocated for this purpose. But, irrespective of how efficiently these preventive measures are practised, some blowfly strikes will occur, and they require curative treatment with a suitable dressing.

The following may be regarded as the characteristics of an ideal dressing:—

(i) It should be stable. This implies that it should be unaltered by shaking and by exposure to various atmospheric temperatures. The dissolved components should not separate from solution on standing, the active chemical constituents should not deteriorate on storage, and, if an emulsion or a suspension, it should resist physical separation into layers.

(ii) It should possess sufficiently low viscosity and surface tension to enable it to penetrate readily to a strike wound and into the surrounding fleece.

(iii) It should not damage the fleece, and it should be easily removed in the industrial process of scouring.

(iv) It should resist atmospheric decomposition after application to the sheep and should not be readily removed by rain or urine.

(v) It should kill the maggots in a strike or so injure them that they can do no further damage.

(vi) It should be non-toxic to sheep.

(vii) It should promote rapid healing of the strike wound.

(viii) It should prevent restrike both during the healing process and subsequently.

(ix) If an aqueous system, the dressing should be easily prepared by adding water to the solid components. It could then be distributed to the grazier in powder form.

(x) It should be cheap.

Many difficulties are encountered in obtaining these desired properties. For example, most substances which are toxic to blowfly larvae are also toxic to sheep. This applies to both stomach and contact larvicides, either of which may have local or systemic toxic action on the sheep. Fortunately, the difficulty with contact poisons usually may be overcome by diluting them beyond the irritant concentration without entirely destroying their larvicidal action.

Another difficulty sometimes encountered is to improve the fleece-penetrating properties of aqueous systems by the addition of wetting agents without increasing the ease with which the dressing can be washed out of the fleece, and without reducing its stability, if it be an emulsion or a suspension. Furthermore, increasing the proportion of the oil phase in an aqueous emulsion to improve the contact-larvicidal action or the fly-repellent action of a dressing may so increase the viscosity or decrease its stability as to render the preparation useless.

Experimental work has shown that boric acid is the best stomach larvicide for use in blowfly dressings. When the price of glycerine made the cost of the "glycerine-diboric" dressing prohibitive, experiments on boric acid dressings were conducted, resulting in the development in 1939 of what was known as the C.B.E. dressing. This dressing, however, contains camphor oil, which is now difficult to obtain.

Mr. F. G. Lennox, M.Sc., of the Council for Scientific and Industrial Research, describes a new dressing which has recently been evolved, and given the name B.T.B.

This new B.T.B. dressing is made from boric acid, tar oil, bentonite, a wetting agent, and water. It can be readily prepared by graziers for their own use.

During the limited time this dressing has been under trial, it has given promising results.

B.T.B. dressing is prepared of the following composition (recorded as percentage by weight):—

	Per cent.
Boric acid (finely powdered) ..	30·0
Tar oil (straight fraction, boiling range: 170-210°C.)	2·0
Bentonite (Wyoming, U.S.A.) ..	2·0
Wetting agent (Agral 2 is satisfactory)	0·5
Water	65·5

The proportion of boric acid in the above formula can be reduced, if desired, to 15 per cent. Such a dressing would be cheaper than that containing 30 per cent., and, although it may not give such good protection against restrike, its protective value should be sufficient for most purposes. In severe waves, a dressing containing a higher concentration of boric acid, such as the 30 per cent. preparation, would be preferred.

Some samples of dressing containing only 15 per cent. boric acid were found to be unstable, due probably to improper mixing or to minor fluctuations in the quality of the components. Therefore, to guard against instability, the bentonite content of this dressing has been increased to 3 per cent. Thus, the 15 per cent. boric acid preparation has the following composition:—

	Per cent.
Boric acid	15·0
Tar oil	2·0
Bentonite	3·0
Wetting agent	0·5
Water	79·5

It is important to realize that this dressing cannot be prepared by mixing 30 per cent. boric acid preparation with an equal volume of water. Such a dilution would halve the concentration of all components, including bentonite, and would produce a very unstable preparation.

For convenience, it is suggested that both dressings might be referred to as B.T.B.; that is, by using the initial letters of the three main components. They could be distinguished by describing the one containing 30 per cent. boric acid as B.T.B.30 and the other as B.T.B.15.

Method of Preparing Dressing B.T.B.

The simplest and most satisfactory of the methods yet tried for the preparation of these dressings is to mix thoroughly the three solid components to a uniform powder and then add water gradually, forming at first a thick paste and finally a thin suspension. If, at this stage, the mixture appears to be uniform, the tar oil may be added with rapid stirring or shaking until uniformly distributed. Thus the directions for preparing 3 gallons of B.T.B.30 are as follow:—Mix 9 lb. of boric acid powder with 9½ oz. bentonite (Wyomacla) and 2½ oz. Agral 2 to a uniform powder in a 4-gallon tin. Add 2 gallons of water (not hard water) and stir for at least ten minutes. Finally, add ½ pint of tar oil and stir for a further ten minutes or until the mixture is uniform.

To prepare 3 gallons of B.T.B.15 follow the same procedure, but use 4½ lb. boric acid and increase the bentonite to 14 oz. and the water to 2½ gallons.

Home preparation of the dressing would save freight on the water component, and it is therefore strongly recommended. To simplify the procedure, it is suggested that manufacturers might supply graziers with the requisite quantities of boric acid, bentonite, and wetting agent ready-mixed, together with the tar fraction in a separate container. From these materials the dressing could be quickly prepared without heating or other inconvenience.

It is important to realize that the method of preparing B.T.B. has an important effect on its stability. Although a satisfactory dressing may be prepared as described above, or, alternatively, by incorporating the Agral 2, boric acid, bentonite, and tar oil in water in that order, the addition of the tar oil before either the boric acid or the bentonite greatly diminishes the stability. It is essential to disperse the boric acid by means of the bentonite before adding the tar oil, as otherwise the stabilizing action of the bentonite is destroyed.

If the dressing is prepared by adding the components singly to the water, it is advisable to use the granular variety of bentonite in order to avoid the formation of lumps.

Bentonite is a clay, and, although clays of this type are obtainable in Queensland, they are unstable. This, however, may be overcome by purification. American processed bentonites from Wyoming have proved excellent, and can be procured from wholesale chemists for about £20 15s. per ton in Melbourne.

Boric acid at present costs about 10d. per lb. wholesale, and tar oil about 2s. 6d. per gallon.

Method of Application.

The wool must be clipped from the affected parts and the dressing applied by swabbing.

By S. C. POWELL, B.Agr.Sc., Assistant Agrostologist

PASTURE investigations in the Central and South Gippsland districts by the Department of Agriculture in conjunction with the Victorian Pasture Improvement League lead to certain general conclusions which may be used by farmers in these districts as a guide in pasture development.

Pasture improvement may be considered from three aspects—the fertility of the soil, the introduction of species, and management. Of these the building up and maintenance of soil fertility is of first importance.

The Use of Fertilizers.

Many elements or chemical substances are essential to plant growth. Fortunately nearly all of these are to be found in sufficient quantities in the soil, but phosphorus, potash, nitrogen, or lime might be scarce. Although all the other elements may be plentiful, plant growth will be limited by a shortage of any one of these, and until the element which the soil lacks is supplied the plant cannot make its maximum growth. Animal manure, to some degree, supplies most plant food elements, but if the element that is limiting growth can be discovered the application of a fertilizer containing that element in a soluble form is all that is needed.

Superphosphate.—Phosphatic manure is obtainable in the cheapest and most satisfactory form as superphosphate, and it is no exaggeration to say that all Gippsland soils will respond to dressings of this fertilizer applied at the rate of from 1 bag (186 lb.) to 2 cwt. per acre each year to such a degree that even on those areas which are reputed to be of high fertility the cost of application, in most cases, is returned several times over. Clovers especially make vigorous growth in response to superphosphate, and mowing tests have proved that pastures which, unmanured, produce about 5 tons of greenstuff per acre per year, on the average will produce from 8 to 10 tons of greenstuff when they receive a liberal dressing of superphosphate. The lighter, less fertile soils will, of course, give a more marked response than heavy rich soils.

The greatest benefit will be obtained if this fertilizer is applied in the early autumn. A drill, a direct-drop spreader, or a centrifugal spreader may be used, but on steep country where it is impracticable to use a horse-drawn implement it will pay to top-dress by hand.

A vigorous growth of pasture due to superphosphate is shown at the right of the picture.

Lime.—As calcium is usually present in the soil in sufficient quantities for plant nutrition, lime is generally regarded not as a fertilizer, but rather as a soil ameliorator or acidity corrective. Clay soils are made easier to work and the health of stock on limed pastures may be improved, but in the red hill country of Mirboo North, in the Warragul district, certain soils give a good response to superphosphate only after they have been limed. Liming alone gives no visible result, but the response to the combination of lime and superphosphate is very marked.

An application of ground limestone at 1 ton per acre will benefit those soils for ten or more years, as indicated by experimental areas under lime. Where the lack of lime is definitely limiting growth, the superphosphate response will often be doubled by liming.

The form or brand of lime applied is unimportant so long as the material is in a finely ground state, but as the effect depends on the percentage of calcium oxide, burnt lime applied at half a ton per acre or slaked lime at three-quarters of a ton per acre will have the same effect as 1 ton of ground limestone. These possibly will give a more rapid response on account of greater solubility, but finely ground limestone will ultimately give the same effect and will indicate its worth in the first year.

A narrow strip of land, say half a chain in width, treated with lime at the rate of approximately 1 ton per acre across an area which is well "supered" will soon demonstrate, by any increase in the vigour of the sward or clover growth, whether or not lime is needed. By this simple test labour and money are saved in cases where liming is ineffective.

Potassium.—Sometimes soils are found to be falling off in their productivity even when they have received a heavy dressing of superphosphate and lime. The reason may be that the potassium content has become low owing to repeated cropping or cutting for hay without providing for the return of animal manure to the soil. Some soils in the Warragul district have revealed a low potassium content after a few years of continued mowing of experimental plots, and except where potassic fertilizers are applied the productivity has fallen away considerably.

Fortunately very little plant potash is absorbed by the animal, the bulk of it being returned to the soil in the urine and dung, and although potash will have to be applied in the form of artificial fertilizer in later years, the time when that will be necessary can be deferred by grazing the area for a few years between hay crops or spreading plenty of stable manure where available.

Nitrogen.—Soil nitrogen fluctuates with seasonal conditions (rainfall mainly), the proportions of leguminous plants (clovers and trefoils), the presence of soil nitrogen bacteria, and organic fertilizer (dung, urine, plant residue or humus).

If a pasture has a high percentage of clovers, the nitrogen problem does not occur since clover, by the action of nitrifying bacteria in the nodules on the roots, can collect atmospheric nitrogen and make use of it or pass it on to the grass and other plants in the sward.

Supplying nitrogen artificially by the application of sulphate of ammonia in the early spring stimulates grass growth, but usually gives the clovers a setback. Its use on pastures cannot be recommended because the response is temporary and the expense of application is not justified.

But if a strong growth of clovers is maintained by attention to other fertilizer considerations nitrogen deficiency is not likely to occur.

Species most suitable for Central and South Gippsland.

Native pasture species are hardy as they are well adapted to the conditions in which they are found, but they are relatively unproductive, and certain introduced species are much more valuable. The climatic conditions of Gippsland and the infrequency of drought make that area very suitable to the growth of European species which would die out in areas of low rainfall. Such species are finding their way into the pasture lands of the wetter areas and can be encouraged to dominate the native species simply by adequate top-dressing.

The four most valuable introduced species are:—Perennial rye grass, cocksfoot, white clover, and subterranean clover.

If a balanced sward of these four species can be obtained the growth will be distributed throughout the greater part of the year. Rye grass and subterranean clover give autumn, winter, and spring growth, while cocksfoot and white clover are late spring and summer growers.

If the soils are of heavy to medium texture, of high fertility and well worked down and free from weeds, rye grass and cocksfoot may be sown at the rate of 10 lb. of each per acre and the clovers at 2 lb. per acre each, in the early autumn, but the components and rates of this mixture may be varied according to the soil texture, aspect, and slope, preparation of the seed bed, time of sowing, and the strain and germinability of the seed. The establishment of the pasture will be governed by the rainfall and temperatures following sowing. Consequently, any seed mixtures advocated for a given set of conditions can be regarded as approximate only. In general, when conditions are favorable for early sowing light seedings will be effective, but it is desirable to increase rates as the autumn advances.

Three types of sward. Top—weedy, open, unproductive; Centre—a pure grass sward of medium value as a fodder; Lower—a strong sward of grasses and clovers of high fodder value.

Rye grass and white clover thrive best on heavy moist flats, while cocksfoot and subterranean clover do best on the lighter soils of

Deep, red soil seen in a roadside cutting at Ellinbank.

undulating or hill country. The best establishment is obtained on land that has been cropped for a year or two previously because it is free from weeds, fungus, and insect pests, but top-sowing after surface cultivation in the early autumn, provided the soil is moist, is generally a satisfactory method of establishing perennial rye grass and subterranean clover, especially if a light scratching is given to cover the seed. The seed may be mixed with superphosphate for even distribution, but if this is done it should be sown immediately, as the germination is lowered after it has been in contact with this fertilizer for a day or two.

Perennial red clover or cow grass is sown in association with cocksfoot in the hill country, and is regarded as a good constituent of meadow hay. It tends to thin out after a few years however.

Phalaris tuberosa, which is a strong winter-growing but drought-resistant grass, is sown occasionally, but it is difficult to establish, and tends to become coarse. The seed is expensive, but a light sowing of 2 or 3 lb. per acre is sufficient if by itself, or with a pound or two of clover seed per acre.

The value of many of the volunteer species, such as *Paspalum dilatatum* (a good summer grower in wet areas), Yorkshire fog grass (when kept short), native grasses, such as Danthonia (Wallaby grasses), Lotus species (trefoils), suckling and other annual clovers which are often hardy growers and small species which make up the balance of a sward, should not be discounted, but if these and weed growth (notably flat weed and rib grass which thrive on infertile soil) can be diminished in favour of rye grass, cocksfoot, white and subterranean clover, the pasture will be considerably improved.

When a sowing programme has been arranged the best seed should be obtained, if possible the Government certified strains, because a high germinating uniform sample of the most suitable type will then be ensured.

Hawke's Bay perennial rye grass has been much in favour in Gippsland because the conditions there are similar to those where the seed originated. At the same time the Victorian certified strains are becoming even more popular.

The Gippsland-grown cocksfoot seed is quite suitable and is superior to the imported strains, with the exception perhaps of Akaroa cocksfoot. It requires a good summer rainfall and should not be allowed to grow tall or it will become harsh and unpalatable.

Midseason commercial subterranean clover which originates from Mt. Barker (South Australia), where the value of this annual clover for Australian conditions was first observed, is most commonly used, although the lateness of spring in Gippsland favours the late flowering Tallarook strain, more of which is being sown in recent years. It is a leafier and more vigorous grower in a favorable area

The provision of fodder reserves on this well-kept Drouin farm is part of the owner's regular annual routine.

than the midseason strain, and the seed can be purchased in Government sealed sacks in the same way as the rye grass, safeguarding the farmer against misrepresentation.

The New Zealand wild white clover is the most satisfactory strain for non-irrigated areas in Victoria. White Dutch is not recommended for permanent pastures as it is short-lived and not so leafy.

Pasture Management.

Although a farmer may have brought his soil up to a state of high fertility and have established a healthy sward of the better grasses and clover, he still has to consider the question of management in order to get the best out of his sward. If he grazes too often or too severely some species may not recover, whereas if he allows the sward to grow too long it becomes rank and unpalatable. Furthermore, low-growing species like white clover will be suppressed.

The rate of growth of a plant depends upon its area of leaf surface, and it has been found that by resting a sward for a month or more between grazings (depending, of course, on the vigour of growth) the greatest bulk of nutritious feed will be obtained.

Conservation of fodder in the form of hay or silage for lean periods is a wise practice, but if it can be arranged that a different paddock be shut up for hay each year the clovers will not be suppressed, and the coarse grasses like Yorkshire fog will not be given a chance to become rank and dominant. Also, as previously indicated, the potash of the soil will not be depleted so rapidly.

Thistles, bracken fern, and any other undesirable weeds should be destroyed as soon as they appear, but a strong, judiciously grazed pasture will compete successfully with most types of weeds.

Animal manure should be scattered by harrowing.

Points to Remember.

The following points for pasture improvement in Central and South Gippsland should be of assistance to farmers in those districts:-

1. Apply superphosphate annually at the rate of one bag (186 lb.) to 2 cwt. per acre.
2. If the response to superphosphate is poor try out a lime strip across the area. If lime is needed apply a finely ground brand at the rate of about 1 ton per acre every ten years, or lighter dressings at more frequent intervals.
3. Encourage the best species, perennial rye grass, cocksfoot, subterranean clover, and white clover, and if sowing down select the most suitable strains, not the cheapest.
4. Regulate the grazing so that no species is given a severe setback or allowed to become rank or dominant. In this way a balanced sward of grasses and clovers will be maintained.
5. Scatter the dung occasionally to make the best use of it and so avoid rank unpalatable patches.
6. Do not close up the same paddock for hay each year. Otherwise the clovers will die out, the coarse grasses will thrive, the sward will become thin and open or weedy, and, unless sufficient animal manure is returned to the soil, the potash will be rapidly depleted.

Phosphatic Licks for Sheep are of No Value in Australia

The following article is supplied by the Division of Animal Health and Nutrition of the Council for Scientific and Industrial Research

THE fact that the soils of the greater portion of the country where sheep are depastured in Australia have a low phosphorus content led some years ago to the assumption that the productivity of our flocks is reduced by a lack of phosphorus in the pastures. This assumption resulted in the use of phosphatic licks.

Before the visit of the noted veterinary scientist Sir Arnold Theiler in 1928, the use of phosphatic supplements was infrequent, but afterwards the practice spread rapidly and became more or less an accepted commonplace of sheep husbandry in Australia. Theiler had observed the remarkably good effects on the health and productivity of cattle when the natural diet of the herds grazing on the Strandveldt in South Africa was supplemented with bone-meal, and, although his conclusions were based on observation of cattle, sheep graziers applied them to sheep with equal enthusiasm. The demand for phosphatic licks accordingly increased, and it was stimulated further and maintained by an advertising campaign of considerable scope.

Certain observed facts seem to support the view that grazing sheep suffer from the effects of phosphorus deficiency in Australia. These facts are briefly mentioned in paragraphs (i) to (iv) below:—

(i) Chemical examination of grass or pasture samples have shown on many occasions that the amount of phosphorus in much of the natural fodder is low when compared with that of well-manured sown pastures or with that of pasture samples from rich and fertile areas in other countries; this is especially so when the pastures have matured and dried.

(ii) The bones of sheep confined to certain areas have been observed commonly to be so poorly mineralized that the ribs and long bones frequently break.

(iii) In some areas sheep may develop a craving for, among other things, the remains of old carcasses, the eating of which results in serious losses through botulism. In South Africa, cattle also develop a similar craving which leads to the fatal "Lamsiekte" disease, which can be prevented by frequent dosing with bone-meal.

(iv) Calculation from chemical examination of pasture samples of the phosphorus taken in by the sheep in its food has suggested that the phosphorus requirements of the grazing animal could not be fulfilled from these pastures alone if the generally accepted figures for the requirements of phosphorus were true.

To sum up, the idea of phosphorus deficiency had much circumstantial evidence to support it. The assumptions upon which the widespread use of phosphatic licks have been based, however, are not convincing if they are examined critically, nor are they supported by scientific experiments or careful field trials. The evidence against the use of phosphatic licks is discussed below.

The small amount of available phosphorus and nitrogen within the soils certainly limits plant growth, but those plants which do develop are not necessarily so short of phosphorus as to cause any degree of phosphorus deficiency in sheep depastured or feeding on them.

Chemical examinations of pasture samples are really of little help when used to determine the amount of phosphorus which may be absorbed by the sheep in grazing. Sheep are extraordinarily selective in their feeding, and will pick out young shoots from green pastures and seeds from dry ones. As both young shoots and seeds contain more phosphorus than the grass itself, it will be seen that the sheep really get more phosphorus than is indicated by the ordinary chemical examination of the pasture.

Further, the amount of phosphorus required by an animal varies with the nature of its diet, and, as a general rule, only when the ordinary diet is satisfactory in all other respects is the amount of phosphorus likely to be a real factor in the animal's development or productivity. Under natural grazing conditions in Australia the amount of protein and certain other constituents in the fodder impose the first limiting factor on productivity, and, as shortage of protein and shortage of phosphorus in pastures go together, additional phosphorus is not likely to benefit the grazing sheep until the other deficiencies of the pastures are overcome.

All the phosphorus present in the fodder is not utilized by the sheep; some passes through the body and is rejected in the excrement. The percentage amount of phosphorus absorbed is greatest when the quantity eaten is small; therefore, in practice, sheep may obtain their requirements from food which contains less phosphorus than a study of good pastures would indicate.

Even if seasonal influences periodically reduce the amount of phosphorus present in the diet selected by the sheep from natural pastures until it is no longer sufficient entirely to prevent loss of phosphorus from the body, the sheep's framework or bony tissue is able to provide a buffer and prevent any undue effects. This is materially assisted by the storage in the porous bony parts, during periods of comparative plenty, of relatively large reserve supplies of phosphorus which are automatically drawn upon in times of need.

The abnormal bone developments which occur in sheep grazing in Australia are due primarily to causes other than lack of phosphorus, and, in spite of repeated attempts, neither the perverted appetite or craving which sheep develop in some areas nor its fatal consequences may be alleviated by the use of phosphatic licks.

Of all the arguments used to support the view that grazing sheep require additional phosphorus, the one based on the experiences with cattle in South Africa is, perhaps, the weakest, for it is not logical or sound to compare the performance of cattle with sheep even under the same grazing conditions. Phosphorus is almost wholly present in an animal in the bony structure. Because there is a considerably greater amount of bone and, therefore, phosphorus in the carcass of cattle than in that of sheep, the demand of the calf for phosphorus is greater than that of the sheep; also cattle require less fodder per unit live weight to maintain them than do sheep. These factors are additive, with the result that cattle require a much greater quantity of phosphorus in their food than do sheep if they are to be kept on an equal nutritional plane. Under natural grazing conditions, where this demand for phosphorus is not readily met, cattle suffer a further disadvantage in that they consume much of the poor harsh fodder which is disregarded by the sheep, and so are the less able to obtain their phosphorus requirements.

It is not surprising, therefore, that grazing cattle in many areas in different parts of the world have been shown to benefit from additional phosphorus in the form of bone-meal or licks. *In the case of sheep grazing on natural pastures, either in Australia or elsewhere, there has been no clear demonstration that they derive any benefit from phosphatic licks.*

The above facts became apparent as a result of tests which were carried out in the Nutrition Laboratory of the Council for Scientific and Industrial Research prior to 1935, when a series of experimental studies which were initiated ten years before had advanced sufficiently to cast grave doubt on the occurrence of phosphorus deficiency in grazing sheep and on the practice of employing phosphatic licks. It was realized, however, that in experiments with sheep, either under laboratory conditions or under semi-intensive observation in pens, it is not possible to imitate the many conditions which occur in the field. In consequence, a series of properly-controlled field trials was planned to study the effect of supplying extra phosphorus to flocks grazing on a variety of different types of country where the soils are known to be very low in their phosphorus content.

In this programme the Council's Animal Nutrition Laboratory was afforded the very valuable co-operation of the officers of the Western Australian State Department of Agriculture, who, according to the general plan, undertook to carry out critical trials at two sites in Western Australia, where the Department previously had established experimental sites owing to the serious prevalence of pica (perverted appetite) and the associated botulism among the flocks. The losses in these areas had been considered to be associated with lack of phosphorus. The directors of the Australian Estates Company also volunteered to put the matter to critical test on one of their station properties at Manuka, in West Queensland, and agreed to a general plan which entailed adequate experimental control. Finally, the Nutrition Laboratory commenced carefully-controlled trials at two sites, one at Young, in New South Wales, and one at Penola, in the south-east of South Australia, where the soils are very low in phosphorus and where cattle had been observed from time to time to chew bones.

In the field tests conducted in Western Australia by the Western Australian Department of Agriculture, and in Queensland by the Australian Estates Company, licks composed of dicalcic phosphate and common salt were employed. In those conducted by the Animal Nutrition Laboratory the total phosphorus (in the form of phosphate) to be supplied was given in three doses weekly, either as a drench (Young trial) or as pills of dicalcic phosphate (Penola trial). The performance of the sheep in the treated groups was compared with that of those untreated groups which were kept otherwise under identical conditions.

The results of these careful trials proved in all cases that the added phosphorus did not benefit the flocks. Most of the sheep were under observation from six months of age until maturity and then over two consecutive lambings. At frequent intervals records of body weight were made; records were also kept of the quantity and quality of wool produced, the lambing percentage, and the manner in which the ewes supported their lambs, which was judged by the growth of the lambs during their period of suckling. The results obtained from the sheep given additional phosphorus were compared with those obtained from the sheep not so fed, and no differences were seen.

A description of the experiments and the main results obtained from the trials conducted in Queensland and in Western Australia have already been published. The results of the Council for Scientific and Industrial Research trials, progress reports of which have been published in the Annual Reports of the C.S.I.R. for the last five years, are now being prepared for final publication.

In addition to the trials mentioned above, the New South Wales Department of Agriculture has conducted a series of trials mainly at Glen Innes, and the published data from those adequately controlled show plainly the lack of any benefit from phosphatic licks.

Recommendation.

As properly-controlled field trials, conducted under a series of pasture conditions representing the types of country where phosphorus deficiency of stock might most likely occur, have definitely shown that no benefit follows the use of phosphatic supplements, the general use of phosphatic licks in Australia is not required, and it is recommended that their employment in station practice should be abandoned.

The Separator Float

Probably the most neglected part of a separator is the float which regulates the flow of milk into the bowl. If imperfectly balanced an irregular flow of milk will occur resulting in faulty separation and fluctuating tests. Floats sometimes are badly dented or leaking and become partly filled with milk which quickly commences to putrify. Where the hole is small—perhaps only a pin-hole—considerable time may elapse before the cause of "graded" cream is discovered.

If the float is mended by rough soldering methods it will be hard to clean and will provide conditions particularly favourable for the growth of bacteria. In many instances floats are mended without first being completely emptied. This may cause further trouble. When repairs are necessary they should be done by a competent tradesman who is aware of the importance of the work.

Live Stock Notes

Reminders for June—July

Compiled by A. C. T. HEWITT, M.Agr.Sc., Live Stock Science Officer

The Value of the Agricultural Show.

THIS year, the agricultural and pastoral shows open with the Melbourne Sheep Show, conducted by the Australian Sheep Breeders' Association, from the 28th to the 30th July, 1941. The Horse Parade and Clydesdale Produce Sweepstakes follow on the 13th August at Newmarket. The Pork and Bacon Competitions and many country shows are held later at various dates during the spring.

British breeds of live stock are regarded as being superior to any in the world. This pre-eminence is due in no small measure to the evolution and improvement of live stock breeds brought about by competition in the county shows or fairs, held over a very long period.

Apart from the competition between exhibitors, an agricultural show has great educational value. It is a meeting place where people from far and wide can discuss their farming problems and experiences. The opportunity occurs also of meeting people who have specialized in the study of different aspects of farming. A well-organized show, whether in a small country town or a large city, is always more than worth while for its educational value alone, but, without the competitive exhibits, it is doubtful whether a sufficiently large crowd could be gathered for that purpose. Furthermore, there would be no exhibits present on which the farmers could expound their views.

Before exhibiting live stock, a breeder has, firstly, to breed and rear or buy his stock. Some considerable time before the show, he has to give the stock special feed and attention to get them into good condition, sleek, and well groomed by show time. Then there is the art of training the animals to stand squarely and parade attractively. This enables our leading show ring breeders to score over other competitors, and is well worth consideration by intending exhibitors.

Dairy Cows.

The demand, both at home and abroad, for condensed milk, dried milk powders, and cheese has greatly stimulated their manufacture. The price paid by the factories for whole milk for the manufacture of these products has, in most cases, been sufficient to encourage many farmers to change over from cream and pigs to whole milk. The uncertainty of the pig market and the high cost of supplementary foods for pigs during recent months also have been contributing factors towards this change-over.

When a change-over from the supply of cream to one of whole milk is made, pigs are not the only farm live stock to suffer. The dairy herd itself may suffer by the owner failing to rear his own heifers, or, if he does, failing to rear them properly on the substitute rations.

Calves can be reared cheaply and well on as little as 25 gallons of milk each, and a gruel supplement of equal parts of pollard and linseed meal, to which a cupful of lime water has been added. Half a pound of pollard and half a pound of linseed meal, boiled in 1 gallon (10 lb.) of water, provide, when a cupful of lime water has been added and when cooled to 90°F., a cheap and excellent meal for a six-weeks-old calf.

Gruels may be made also from any of the following concentrates:—(1) Pollard; (2) equal parts of pollard and linseed meal; (3) equal parts of pollard and skim-milk powder; (4) skim-milk powder; (5) three parts of pollard, three parts of dried whey, and two parts of a good quality (dry rendered) meat meal. It is necessary to add a cupful of lime water to gruels 1 and 2. Gruel No. 1 is not equal to gruel No. 2 from a nutritional stand-point, while gruels Nos. 3, 4, and 5 are good, but more expensive.

The average-sized calf should be fed as follows:—

	Milk (3.5% Butter-fat) (lb. per day).	Gruel or Separated Milk (lb. per day).
First week ..	up to 12 ..	—
Second week ..	12 ..	—
Third week ..	9 ..	5½
Fourth week ..	6 ..	11
Fifth week ..	3 ..	16½
Sixth to 24th week	— ..	22

The above quantities should be given in two feeds—half in the morning and half in the evening. Calves receiving no fresh milk, either whole or separated, always should be grazed on green pasture or given some green lucerne hay. Calves born early in the season and reared well always develop into the best dairy cows.

A pamphlet on the rearing, feeding, and management of dairy calves is obtainable free on application to the Director, Department of Agriculture, Melbourne, C.2.

Sheep.

Straight, "Steely" Wool.

In extending their investigations into Coast disease, which is caused by a deficiency of copper and cobalt in the diet, the staff of the Animal Nutrition Laboratory of the Council for Scientific and Industrial Research in Adelaide noted that unsound fleeces, which are referred to in the trade as "straight, steely wool," bore a striking resemblance to those grown on experimental sheep being maintained on a copper-deficient diet. This led to an investigation which showed that sheep suffered from an incipient copper deficiency over large areas of South Australia and probably an incipient cobalt deficiency as well.

These areas extend along the coast and into the light sandy soil areas of the South-east, Mallee, Eyre Peninsula, and West Coast districts of South Australia. Victoria has a number of areas somewhat similar to these districts (some of them just across the border) where the production of "straight, steely wool" can be expected.

The trouble may be corrected by giving the sheep extra copper and cobalt mixed with salt as a salt lick. Only very small traces of copper and cobalt are required by the sheep. Information concerning the mixing and administering of copper and cobalt licks will be supplied on application being made to the Superintendent of Live Stock, Department of Agriculture, Melbourne, C.2.

Horses.

With colder and bleaker conditions, and scarcer pastures, horse owners, especially owners of young horses, are urged to feed their stock well. This applies particularly to young horses, so that their growth may not be checked during the winter months.

Where pastures are poor, the food supply should be supplemented by a daily ration of hay. In cold weather, when horses are fed on chaff, the addition of a little carron oil to the ration is very beneficial. Carron oil can be prepared on the farm by mixing equal parts of lime water and raw linseed oil and shaking well.

Start by feeding a few drops twice daily and increasing to a tablespoonful or more till slight laxative effects are noticed, when the daily dose may be fixed at a slightly decreased quantity.

Stallion owners are reminded that applications for the registration of all stallions for the coming season must reach the Chief Veterinary Inspector by 30th June. Scheduled stallion parades will commence during July, and the dates allotted to the various centres will appear in the press in due course.

The annual parade of stallions and mares, which in the past was held at the Royal Show Grounds during July, will not be held, but arrangements have been made to hold a parade at Mackinnon and Cox's stables at Flemington on 13th August.

The Victorian Branch of the Clydesdale Horse Society of Australia, with the co-operation of the Royal Agricultural Society of Victoria, is continuing the Clydesdale Produce Sweepstakes classes which previously were held at the annual parade at the Royal Show.

Government veterinary officers will be in attendance at this parade to examine any stallions submitted for registration.

[W. D. Shiew, G.M.V.C., B.V.Sc., Senior Veterinary Officer.]

Pigs.

Separated Milk as a Pig Food.

Dairy farmers who have the option of selling either whole milk or cream frequently ask the value of separated milk as a pig food. There is not a satisfactory simple answer to the question, because several variable factors come into consideration.

The economic (cash) value of separated milk can be calculated if its nutritive (pork-producing) value and the net price of pork are known.

The nutritive value of separated milk varies according to the quantity fed, the age of the pigs to which it is fed, and the other foods in the diet.

The nutritive value per gallon of separated milk increases as its proportion to other foods in the pigs' diet decreases. When it forms the sole diet, approximately 6 gallons of separated milk are required to make 1 lb. of dressed pork. When just sufficient separated milk is added to balance a ration, the feeding value of the skim milk is greatly increased.

Pigs at weaner stage and immediately after give a very high return per gallon for separated milk when very small quantities, such as 1 quart daily, are included in their diet.

The replacement value of separated milk might be compared with meat meal, which is the best available protein-rich substitute for separated milk in a diet composed largely of grain, or other foods, such as roots, which are deficient in protein. Approximately ¾ lb. of meat meal, costing about 1d., would replace 1 gallon of separated milk.

The quantity of foods, including separated milk, required to produce 1 lb. of pork varies with the inherent qualities of the pigs and with their environment.

Under the conditions generally prevailing on dairy farms in Victoria where separated milk forms a fairly large part of the diet of pigs, probably 5 gallons would be the approximate average quantity required to produce 1 lb. of dressed pork.

If that figure of 5 gallons is accepted, the next step is to arrive at the net return for pork produced.

It is well known that the value of pigs is a very variable factor, and, therefore, an average price over a long period should be taken rather than the current price in any one month.

The price of porker and baconer pigs on an actual or estimated dressed weight basis is generally well known. These prices do not, however, represent the net return for food consumed by the pigs and their parent stock.

While food costs generally represent the greater part, sometimes 80 per cent., of the total costs of pork production, other production costs, including labour, depreciation on plant, interest on capital, and selling costs, including freight, commission, yard dues, and compensation fund tax when sold by auction, represent about 1½d. per lb. dressed weight on baconers and porkers. This amount should be deducted from the actual selling price per lb. before the net return is credited to the food used.

The term "dressed pork" is used here to indicate fresh pig meat whether it be from pigs of baconer or porker weights and types.

Some consideration should be given to the residual value of separated milk fed to pigs, when their manure is returned to the soil to help maintain the farm fertility.

[L. A. Downey, H.D.A., Pig Expert.]

Poultry.

Poultry farmers should now make all necessary preparations for the coming chicken season.

It is essential that clean, warm, well-ventilated, and comfortable quarters should be provided immediately the chickens are hatched. Fresh air, direct sunlight, freedom from excessive heat, cold, or draughts, ample room and ease of cleaning are some of the important requirements.

One of the most frequent causes of failure and high mortality in rearing chickens is lack of proper sanitation. Brooder floors and runs, and food and water vessels are frequently allowed to get very dirty. It is extremely important that these should be cleaned continually, and, also, that food and water be placed so that the chickens cannot walk into them. Dryness and strict sanitary hygiene are essential in the control of intestinal parasites, and direct sunlight is of immense value as a disinfectant and as a preventative of rickets.

Chickens must not be left in the warm brooder too long. They should be transferred gradually to clean, open range conditions, where they will receive fresh air, sunshine, and freedom, which are so essential for their best development.

Brooder houses should be reserved for chickens only. They should be cleaned and disinfected at the end of the season and left vacant to prevent the introduction of disease the following year. Some time before the chickens are hatched, the brooder should be cleaned and examined so that any necessary repairs can be made. It also should be put into operation to get it into working order before the chickens arrive.

[H. F. Clinton, Poultry Expert.]

Bees.

While work in the apiary is at a minimum, the apiarist should reflect upon his past activities with the object of correcting any faults or mistakes in the coming season. The time is opportune for stimulating the local sale of honey. There is no doubt that, if good honey is put up in attractive containers, the quantity sold to local consumers within reasonable distance of the apiary could be greatly increased. On account of its high sugar content, honey is an energy-producing food very suitable for the winter menu.

The bees should be disturbed as little as possible. Grass should be kept clear of the hive entrances and the hives examined to see if they are weatherproof.

As new tins are now more expensive than formerly, larger quantities of second-hand tins are being used for honey. Every care should be taken to ensure that the bees do not contract disease from the honey left in these tins or from the wash water used to cleanse them. Such tins should be immersed and boiled to destroy all germs immediately they arrive at the apiary.

The cleaning up of beeswax from last year's cappings should now be completed.

[J. S. Eagland and J. W. Thomlinson, Apiary Inspectors.]

Potato Grading

The grading of a parcel of potatoes for market is an important operation, as the price obtained depends on the quality of the sample offered. The neglect to grade well, or the attempt to sell inferior produce, is certain to prove unprofitable, for buyers once repelled are difficult to attract again.

The major portion of the Victorian potato crop is graded by hand, usually in the paddock at harvest time. This means that responsibility for a good grade devolves on the diggers and unless the grower maintains a constant watch on the sample being put up, he may have a line rejected at the station owing to the careless grading of perhaps only one employee.

This risk may be obviated, to a certain extent, by allotting to each digger a distinguishing mark to be branded on all bags used by him, and in the event of any question arising regarding the suitability of the grade, picking over can be confined to those bags bearing the mark of the faulty grader.

Potatoes described as "No. 1 Grade" shall consist of sound potatoes of similar varietal characteristics having regard to colour, shape and general appearance. They should be well shaped, practically free from insect or fungus disease or damage caused by mechanical means, or blemishes, including second growth, frost, sunburn, greening through exposure, sprouting or other injury, or deterioration, and practically free from dirt or other foreign matter. They shall have a mature skin and be not less than 2¼ inches in diameter, or less than 3 oz. in weight.

The "Sectional Contamination" Defect in Butter

By T. M. JENSEN, B.Agr.Sc. (N.Z.), Principal, School of Dairy Technology, Werribee

A TROUBLESOME defect in Australian butter during the past season has been that commonly referred to by dairy officers of the Department of Commerce and the Victorian Department of Agriculture as "sectional contamination." As the term suggests, the condition is one in which variations occur in the quality of butter from one part to another in the same box. The property of the butter chiefly affected is the flavour, and in well-marked cases of the trouble, areas having a distinct off-flavour may be found interspersed with areas of normal flavour in the one core of butter. In such cases the defect may be easily recognized by noting the odour of the butter throughout the length of the core immediately it has been withdrawn from the box and before the rather volatile odour of the defective portions has had a chance to pass off. The intensity of the taints sometimes encountered in badly affected areas may be gauged from the fact that graders have found not infrequently a variation in quality from "choicest" to "pastry" grade to occur in the one core. In earlier stages of development, tasting of the butter at various points along the core may be necessary to detect the defect with certainty, since the difference in quality between affected and unaffected portions of the butter is less pronounced.

The nature of the sectional contamination defect and the frequency of its occurrence in Australian butters were first brought under notice at the laboratory of the School of Dairy Technology, Werribee, early in the present season by dairy officers of the Department of Commerce, and when, some months later, it was found that the incidence of the defect was increasing, the work herein reported was undertaken in an endeavour to provide information as to its cause and control.

Characteristics of the Sectional Contamination Defect.

The chief characteristic of the defect is the manner of its occurrence in the ordinary 56-lb. box of salted butter, localized areas throughout the block taking on a distinct off-flavour and thereby leading to wide variations in quality between different parts of the same box. This feature has differentiated the defect from other types of deterioration and earned for it the name of sectional contamination.

Close examination of boxes of hand-packed butter showing the defect reveals that the defective areas take the form of zones of tainted butter extending through the butter at seams marking the junctions of the different sections of which the blocks are comprised. Sometimes, but not invariably, the outside surface of the block which had been uppermost when packing was completed, will be tainted also, while other outside surfaces will not. It is thus rather typical of the condition that a core of butter removed from an affected box will show a number of zones of tainted butter separated from one another by zones of unaffected butter, the actual number of these depending upon the number of pieces of butter used in filling the box. It not infrequently happens that a core of butter will show the condition while another core removed from the same box will not. It also should be mentioned here that sectional contamination has been reported to occur in butter packed by machines which extrude the butter from a hopper in the form of complete blocks ready for boxing, but an opportunity for investigating such a case did not present itself during the course of the present study.

The defect does not occur in freshly-made butter, but in butter held at temperatures of 40 to 50 deg. F. or higher, it may develop rather rapidly, sometimes becoming distinctly noticeable within a period of three to four days. As a rule, development is more gradual and does not become apparent until the butter is some weeks old. A marked intensification of the taint in affected areas usually occurs in butter held in cold storage (approximately 15 deg. F.) for three months.

Off-flavours encountered in the affected areas of butter vary from mere staleness to distinct fruitiness, cheesiness, or rancidity. The age of the butter at the time of examination is probably a governing factor in regard to the type of flavour found, for observations on affected butters at various ages up to three months have indicated that the off-flavour tends to pass through successive stages of development, being, as a rule, stale or fruity at first, later becoming cheesy, and finally developing into distinct rancidity. In many instances, seams in the butter in which the taint has developed strongly show a distinct bleaching of the colour.

Experimental.

In order to confirm earlier observations which had indicated that the defective areas in a box of butter showing the sectional contamination condition tended to follow the junctions of the several pieces or layers of butter of which the 56-lb. block of hand-packed butter is usually comprised, a packing experiment was carried out at a plant which was experiencing sectional contamination in its butter quite regularly. Salted butter from the ordinary manufacture was packed into a box by the usual factory method, three layers being forced into the box with a wooden packing tool wetted with chilled water from a tub. Small pieces of parchment paper were inserted between the layers to act as markers at the outside edges of the block. A second box of the same butter was packed in similar fashion with the exceptions that the packing was done with a sterile metal tool and no water was carried on to the surfaces of the butter from the tool tub. Examination of the butters after storage at 50 deg. F. for one week revealed fruity patches on a plug from a box packed by the ordinary factory method and bacteriological counts showed these fruity patches to contain higher numbers of organisms than other parts of the butter. After storage for a further three weeks both blocks of butter were removed from the boxes and split into their component layers by forcing a stainless steel blade into the blocks at the points indicated by the paper markers. Examination of the surfaces so exposed showed that a strong fruity flavour had developed between the layers in the box packed by the ordinary factory method while other parts of the butter remained quite normal. The second box of butter was normal throughout. Bacteriological counts made at this time on scrapings of butter taken from the freshly exposed surfaces and also on samples from deeper portions of the butter gave the following results for the two boxes:—

Sample.	Butter Packed by Ordinary Method.	Butter packed without Use of Wooden Tool or Water.
Exposed surface ..	6,200,000	78,000
Deeper portion ..	66,000	55,000

(Counts per ml. of butter on skim-milk agar at 30°C. for five days.)

These results confirmed the belief that the fruity areas occurred at seams marking the junctions of the separate pieces of butter packed into the box and also suggested that a biological agency was responsible for the development of the taint in these areas. Accordingly, investigation was approached from this angle, and, as a further step, bacterial counts were made on samples from affected and unaffected areas in butters from a number of factories experiencing the trouble.

Bacterial Counts on Samples from Affected and Unaffected Areas in Butters Showing Sectional Contamination.

Boxes of butter from each factory were sampled by drawing plugs the full depth of the box and noting the odour of the butter throughout the length of the plug. Where instances of sectional contamination were encountered the defective areas invariably occurred at seams marking the junction of layers or at the surface.

Location of these areas was frequently assisted by the core of butter cracking apart at the seams as it was withdrawn from the box. Samples for examination were obtained from the affected portions of the cores by removing sections extending about ¼ inch on either side of seams where the taint had developed strongly. Samples of unaffected areas were taken from the same plugs at points well removed from the affected areas. Samples taken at the seams and between the seams in a few boxes of butter not showing sectional contamination were included to serve as controls.

Counts were made by the plate method using skim-milk agar and an incubation of five days at 30 deg. C. Counts were also made on gelatine incubated for three days at 20 deg. C. The five-day gelatine count was not obtained.

Box No.	Portion of Block of Butter.	Count per ml. of Butter.	
		Skim-milk Agar.	Gelatine.
	Butters showing Sectional Contamination.		
1	Interior ..	3,100	Less than 100
	Interface ..	3,260,000	120,000
2	Interior ..	790,000	20,000
	Interface ..	16,000,000	6,000,000
3	Interior ..	6,800	500
	Interface ..	54,000	250,000
4	Interior ..	3,000	Less than 100
	Interface ..	4,000,000	500,000
5	Interior ..	9,000	500
	Interface ..	4,800,000	85,000
6	Interior ..	95,000	2,000
	Interface ..	Too numerous to count	6,400,000
7	Interior ..	65,000	Not done
	Interface ..	Too numerous to count	Not done
8	Interior ..	42,000	Not done
	Interface ..	Too numerous to count	Not done
	Butters not showing Sectional Contamination.		
9	Interior ..	18,000	
	Interface ..	10,200	
10	Interior ..	90,000	
	Interface ..	70,000	
11	Interior ..	12,000	
	Interface ..	15,000	

In addition to the wide differences observed in the counts between affected and unaffected portions of the butter, an interesting feature of these examinations was the predominance of large opaque colonies on the plates prepared from affected portions of butter together with their much lower proportion on plates from unaffected portions of butter. Many of these colonies were actively caseolytic. Microscopical examinations showed them to consist mainly of non-sporing Gram-negative rods. Yeast and mould counts were made on a number of samples, but as the results appeared to bear no relation to the condition of the butter these counts were discontinued.

Experimental Reproduction of the Sectional Contamination Defect.

In order to obtain a more direct type of evidence that the organisms found in the tainted areas of the butter were responsible for bringing about the condition, some small-scale churnings were made from the following types of cream:—

(*a*) Pasteurized cream inoculated with butter from affected areas of a box of butter showing the sectional contamination defect.

(*b*) Pasteurized cream inoculated with butter from unaffected areas of a box of butter showing sectional contamination.

(*c*) Pasteurized cream from the same batch as (*a*) and (*b*) but not inoculated.

The cream for these churnings was pasteurized and cooled in a single batch and afterwards divided into three portions, two of which were inoculated as above after the method of Derby and Hammer(1). A third batch of the same cream, not inoculated, was kept as a control. After holding the creams overnight at 50 deg. F., churning was carried out in small churns. Each churning of butter was divided into two portions, one of which was salted, and these were worked separately on a small wooden hand-worker which had previously been treated with large volumes of boiling water and steam. After working, the butters were packed in layers into boxes, using wooden utensils which had previously been autoclaved.

Examination of the butters after they had been held at 50 deg. F. for four days showed that the unsalted butter from cream (*a*) had developed a strong fruity flavour while the salted butter from the same cream had only a slight off-flavour. This slight off-flavour did not resemble the flavour of the original defective butter and did not intensify as the butter aged. In neither the unsalted nor the salted butter was the off-flavour more pronounced at the junction of the layers than in other portions, its distribution being even throughout the whole of the butter. Butters from cream (*b*) showed no off-flavour either in salted or unsalted lots, and this was also the case for the control butters made from cream (*c*).

Another attempt to reproduce the typical sectional contamination condition in salted butter was made by inoculating a dilute (1:1,000) water-emulsion of affected butter on to the surfaces of pieces of freshly-made butter in such a manner that a film of the emulsion was incorporated between the butter layers when they were packed together into a

block. A similar procedure was followed with another block of butter, the inoculation in this case being with an emulsion of unaffected butter.

Within 48 hours at 50 deg. F. the block inoculated with the emulsion of affected butter had developed a fruity flavour at the junctions of the layers, and this flavour became stronger as the butter aged. The affected areas could be easily located, as fruity patches on a core of butter removed by boring more or less at right angles to the junction of the layers. No off-flavour developed in any part of the control block of butter.

Source of Organisms Causing Sectional Contamination in Factory Butter.

With a view to ascertaining whether the organisims responsible for the defect were derived directly from the wooden utensils themselves or from the water used for wetting these utensils, further packing experiments were made at the butter plant previously referred to, while the trouble was still being experienced. The water supply to the plant at this time was not being chlorinated and the wooden utensils used for packing the butter were treated after use by washing in hot soda solution and then scalding for a few minutes in boiling water.

In one experiment a box of butter was packed without contact with the wooden utensils (a sterile glass bottle was used for a packing tool) and water taken from the factory main was sprinkled over the surface of each layer of butter placed in the box. In another experiment the wooden packing utensils which had been given the ordinary factory treatment and dried overnight, were wetted with sterile water and used to pack another box. After a week's storage both boxes had developed sectional contamination, the condition being somewhat more pronounced in the butter packed without wooden utensils and wetted with factory water. Counts made on affected and unaffected portions of these butters showed similar differences to those already reported and the predominating colonies on plates made from affected portions were similar if not identical in type for both butters. Organisms isolated from these colonies were later inoculated on to surfaces of freshly made butter to determine whether any particular type was responsible for the off-flavour of the affected butter. Some of them proved capable of producing taints of various kinds, but none developed an off-flavour resembling that of the butter from which they were isolated. No further isolations and inoculations were tried since it became apparent that mixtures instead of pure cultures of organisms were probably involved, and hence that the number of trials necessary to arrive at the right combination might be enormous.

Shortly after the packing experiments referred to in this article were carried out, the water supply to the plant was chlorinated and the wooden utensils were subjected to an intensive heat treatment in a pressure steam sterilizer. This resulted in an immediate and complete disappearance of the defect from the factory's butter output.

Discussion of Results.

The observation that defective areas in hand-packed butters showing sectional contamination are confined to those parts of the butter which are contacted or wetted by the utensils used in the packing and finishing operations at once explains the characteristic distribution of the tainted areas throughout the butter and reduces an investigation of the defect to an examination of the means whereby such contact or wetting of the butter surfaces is capable of causing the development of the off-flavours. It also provides good grounds for suspecting the cause of the defect to be biological in nature, for although it is well recognized that off-flavours in butter can be brought about by a variety of agencies, biological and otherwise, it is difficult to conceive how the type of off-flavour encountered in this defect could be caused by contact with wooden utensils or water unless micro-organisims capable of producing such taints in butter were thereby contributed to the butter surfaces.

The data obtained from bacteriological examination of samples from affected and unaffected areas in boxes of butter which had developed the defect, also support the view that the condition is caused by the action of micro-organisms. The presence of large numbers of micro-organisms in butter is, by itself, admittedly of little significance, for butters of normal flavour will frequently show extremely high counts, but the striking differences in count regularly observed between affected and unaffected areas in the same box, together with the fact that colonies developing on plates from affected portions of the butter were found to consist predominantly of casein-splitting Gram-negative rod types, which were

in much lower proportion or entirely absent from unaffected samples, indicates that the two conditions are related.

Further evidence of the biological origin of the defect is provided by the fact that fruity flavour developed in the unsalted butter churned from cream that had been inoculated with small portions of defective butter, and also by the ease with which a condition resembling sectional contamination could be reproduced in a block of salted butter by inoculating between the layers a dilute emulsion of affected butter. Finally, the sudden disappearance of the condition from the factory butter following chlorination of the water supply and heat treatment of the utensils, leaves little room for doubt that the defect was being caused by micro-organisms carried on to the surfaces of the butter by the utensils or water during the packing operations.

The fact that organisms isolated from defective portions of butter and re-inoculated on to surfaces of normal butter did not reproduce the off-flavour of the butter from which they were isolated, indicates either that the organisms worked with were not those concerned with the development of the defect or that mixtures and not pure cultures of organisms are responsible for the off-flavours encountered in this defect. Herreid(2), from a study of the development of similar off-flavours in unsalted butter, concluded that they are probably produced as a result of the associative action of several species, and that there is a natural relationship existing between the species which cannot be duplicated in the laboratory.

The failure of the fruity flavour to develop in salted butter manufactured from cream inoculated with defective butter, together with the fact of its marked development at interfaces in salted butter where inoculation had been made with a dilute emulsion of affected butter, illustrates clearly the importance of the actual mode of contamination in the development of the sectional contamination defect. Apparently, organisms of the type here concerned are better able to grow and cause taints when present in small amounts of free moisture on or between surfaces of salted butter than when thoroughly worked into the butter itself.

The significance of this fact in relation to factory practice is considerable since it shows that bacterial contamination of the butter with certain types of organisms is more likely to cause defects if it occurs after, rather than before, manufacture is completed. The same point is well demonstrated by the experiments carried out at a butter plant experiencing sectional contamination where it was found that water from the factory main gave rise to the defect when inoculated over the surfaces of salted butter, but no harm appeared to result from washing the butter granules in this water provided the butter was subsequently salted and thoroughly worked. This does not imply, of course, that the presence of other types of organisms in the wash-water is not likely to be dangerous. The disastrous effects which may follow from the use of wash-water infected with certain types is already well known. It does show, however, that there are some kinds of bacteria to be found in water supplies which are better able to cause defects in salted butter when present as surface contaminants than when thoroughly incorporated in the butter itself, and that precautions to avoid such surface contamination of the manufactured butter are therefore quite as essential as precautions to avoid earlier contamination such as that resulting from the use of infected wash-water.

Although the packing experiments carried out at a factory experiencing the trouble revealed that the water supply was the primary source of the causative organisms, it is clear also that the organisms were able to establish themselves in the wood of the packing utensils and to survive there the ordinary cleaning and sterilizing treatment to which the equipment was subjected. This secondary source of contamination no doubt contributed materially to the trouble experienced in the butter.

The suddenness with which the defect disappeared from the butter at this plant following chlorination of the water supply and treatment of the utensils in a pressure steam-sterilizer proves the efficacy of these control measures, but since treatment of wooden utensils by steam under pressure soon results in severe cracking of the wood, boiling in water for half an hour daily combined with chlorination of other water with which they come in contact is probably the best method of maintaining the packing tools in satisfactory condition. The use of packing utensils made from metal or other impervious material instead of wood suggests itself from the standpoint of ease in sterilizing, but the practicability of utensils made from such materials would have to be tested from other aspects, particularly as regards freedom from sticking to the butter, before their adoption could be recommended.

Summary and Conclusions.

(1) The condition known to Australian butter graders as "sectional contamination" has been defined and the chief characteristics of the defect as it occurs in hand-packed salted butter have been described.

(2) The cause of the defect has been attributed to the localized action of micro-organisms which are carried onto the surfaces of the butter by the utensils and water used in the packing operations.

(3) The primary source of the causal organisms which are carried onto the surfaces culty was shown to be the water supply. A secondary source of contamination was created by the organisms harboring in the wood of the utensils where they were able to survive the ordinary washing and sterilizing procedures to which the utensils were subjected.

(4) Chlorination of water supplies and adequate heat treatment of the utensils were shown to be effective control measures.

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References.

(1) Derby, H. A., and Hammer, B. W. Bacteriology of Butter IV. Bacteriological Studies on Surface Taint Butter. Iowa Agr. Expt. Sta. Res. Bull. 145. 1931.

(2) Herreid, E. O. Microbiology of Cheese-Like Flavours in Unsalted Butter. A Thesis Submitted to the Graduate School of the University of Minnesota. 1933.

Tubercle Free Herds

The following herds have been declared free of tuberculosis under the scheme conducted by the Department of Agriculture. Under this scheme a tuberculosis-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests, or, upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

ACCREDITED TUBERCLE FREE HERDS.

Name.	Address.	Number in Herd.	Name.	Address.	Number in Herd.
Ballarat Mental Hosp.	Ballarat	78	Onley, W. H. ..	"Glenholme," Caldermeade	67
Banyule Stud Pty. Ltd.	Heidelberg	34			
Dennis, Mrs. A. A. ..	Frankston	19	Payne, A. E. T. ..	"Yarra View," Lilydale	77
Dookie Agricultural College	Dookie	78	Payne, T. E. N. ..	"Woodburn," Kilmore	58
Dunbar and Clark, Messrs.	"Hazeldean Dairy," Mount Dandenong	15	Powell, T. S. ..	"Carellen," Mansfield	41
Geelong Grammar School	Corio	58	Read, Estate, late John D.	"Springhurst Estate," Springhurst	112
Gorman, A. W. ..	"Cathcart," Alexandra	80	Reid, Ralph G. ..	"Holmwood," Koowee-rup	78
Henderson, J. L. and E. I.	Wangaratta ..	95	Richardson, Bros., Messrs.	"Faldinghurst," Upper Beaconsfield	30
Holloway, R. W. ..	Caldermeade ..	56	Samuel, B. T. ..	Lang Lang ..	60
Kelly, C.	"Glenmore," Creighton's Creek, Euroa	17	School of Horticulture	Burnley	6
Lawrence, P. H. ..	"Rainga," Tarrawarra	60	State Experiment Farm	Rutherglen ..	51
Longerenong Agricultural College	Dooen	46	State Research Farm ..	Werribee	211

In addition to the above-mentioned herds there are 104 commercial dairy herds containing 3,317 head of cattle which may be considered free of tuberculosis. All these herds have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds, they cannot be considered as accredited under the accreditation scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

There are also 113 herds in which 5,986 head of cattle have passed one test, and may be considered therefore to be in process of becoming tuberculosis-free herds.

In the Orchard

By J. L. PROVAN, B.Agr.Sc., Senior Horticultural Instructor

DURING the winter-pruning season, suitable scion wood should be collected, from previously selected trees, for any re-working operations next spring. There is still a large number of obsolete and unprofitable trees growing in many of our orchards, and the present marketing conditions will undoubtedly encourage growers to re-work a number of these trees. Thin, one-year-old laterals of well-matured wood are preferred as scions. Each variety should be tied into bundles and distinctly and permanently labelled. One of the best methods of labelling is to write on a small strip of old galvanized iron with a sharpened nail, puncture a hole in one end, and attach to the bundle by wire. Heel the bundles in the soil in a cool, moist, shady place so that they will remain dormant until required.

Scions should also be collected for grafting on to other varieties to provide for more effective cross-pollination. Most varieties of apples, pears, cherries, plums, and almonds will set better crops if adequate cross-pollination is supplied, and, with the tendency to limit the number of varieties in the orchard to as few as possible, this method of grafting pollinators on to the commercial variety commends itself. Another advantage of this system is that those varieties which are very good for cross-pollinating the main variety, but are useless or undesirable for planting for commercial purposes, can be employed as sources of pollen, by occasional limbs being grafted into the trees. Fruit which sets on these limbs is removed early to ensure blossoms for the next season. Some growers have extended this practice further by placing two or three grafts of pollinating varieties in their main variety. In choosing such varieties they endeavour to provide pollination for the early-, mid-, and late-blossoms, thereby ensuring that maximum crops will be obtained even if unfavorable weather conditions occur at any time during the blossoming period of their main variety.

Red spider has been troublesome in many orchards, and particularly on almond trees. In the deciduous pome orchard fairly effective control of this pest can be obtained by applying a lime-sulphur spray 1 in 10 or a red oil spray 1 in 14, as late as possible, before bud-burst, care being taken to direct the spray upwards to reach the masses of eggs on the lower sides of branches, laterals, and fruit-spurs. It is preferable to delay this spray as long as possible, because the eggs are more easily destroyed with the approach of warmer weather. Control of red spider and/or bryobia mite on almond trees by dormant sprays is more difficult, because the trees blossom in July or early August, when the weather is cold and egg masses are more resistant to the effects of the spray. Incidentally, dormant tar distillate sprays have practically no effect on red spider eggs. The use

of summer white oil sprays, with or without nicotine sulphate, and a combination spray of sulphur and lime-sulphur, have been used successfully in America. The various formulae are:—

(1) 5 lb. sulphur, ½ lb. casein spreader, 1½ gallons lime sulphur, 100 gallons water;
(2) summer white oil emulsion 1½ per cent. (1½ gallons–100 gallons); or
(3) nicotine sulphate (40 per cent.) 1 pint in 80 gallons plus ½ gallon summer white oil.

These sprays should be applied with at least 300 lb. pressure and should be directed towards the lower leaf surfaces. The first application should be made when the red spider population commences to be readily observed, and the spray may require to be repeated if the past infestation has been severe. If a late infestation is noticed in the autumn, one of the above summer sprays should be applied to forestall egg laying.

Tests of reduced concentrations of ethylene gas for colouring early navel oranges have shown that, provided the chambers are gas-tight and temperature and humidity are carefully controlled, successful colouring can be obtained by much lower concentrations than are at present generally employed. In view of the shortage of ethylene, growers are advised to reduce dosages by half and even more, and observe the effect on the time taken for oranges to attain the correct colour.

Unless rain falls in Northern Victoria, growers will have to apply a very late irrigation to sustain both trees and cover crops. It is advisable that this watering should be only a light one, and, generally, growers are very diffident about applying water at this time of the year, because winter rains are expected.

Delay the application of tar distillate sprays for the control of green peach aphid and cherry aphid until as late as possible in July. This will allow time for migration and egg laying of the aphid to be completed. This spray is not dangerous to the trees provided it is applied before bud movement occurs.

Olives are usually harvested during this time of the year, and many growers are finding that head-land trees or break-winds of olives can be very profitable. Care should be observed in harvesting, and the olives should be delivered to the factory as soon as possible. The best oil is made by processing the olives as soon as they are gathered, but sometimes this is impossible because of the quantity arriving at the factory. In that case partial drying, by spreading the olives about 3 inches deep on wooden trays in a well-ventilated shed, should be undertaken.

Growers who have only a light infestation of San José scale are recommended to prevent a build-up by applying a dormant spray. First, affected trees should have all loose bark scraped off, and then a thorough application of a combined spray—2 gallons winter oil and 5 gallons of lime-sulphur made up to 80 gallons with water. Straight lime-sulphur 1 in 10 or red oil 1 in 14 also are effective sprays.

When planting citrus, or other evergreen trees which are bare-rooted, do not omit to prune back the top very drastically; otherwise the subsequent drying-out will give the trees such a set-back that they may take months before growth commences, and in some cases they may not even survive. Cut back the main arms to four to six buds from the trunk or, if reheading the tree, remove all the top at about 14 to 18 inches from the soil level. Remove all but a few leaves. When received from the nurseryman, thoroughly wash the roots and stand the trees in water for about twelve hours.

Some growers are concerned about the effects on the trees of the large quantity of windfall fruit which must be ploughed under this year. In acid soil types and where decomposition of the mass of fallen fruit is slow, surface soil conditions must deteriorate temporarily. Under such circumstances it is advisable to plough the fruit under and apply up to 1 ton of agricultural lime per acre.

In the Garden

By A. W. JESSEP, M.Agr.Sc., B.Sc., Dip. Ed., Principal, School of Horticulture, Burnley

FROSTS have cut back the frost-tender plants, and the garden should be given a good overhaul this month. If any deciduous trees or shrubs are required, this is a good month to obtain and plant them. The soil around the winter annuals should be well stirred to prevent it from setting and becoming too wet and cold near the stems of the plants.

Where necessary, give a liberal dressing with lime. Put the lime on the surface after digging the area, as it will gradually work down into the soil. Cut back the shrubs and climbers requiring winter attention, so as to allow the light to get to the soil as much as possible.

The rose, no doubt, is the most popular plant in the garden, and no garden, however small, can afford to be without a rose bush. Roses are hardy and will grow in almost any soil, although they prefer a loam with a good clay underlying it. June and July are the best months to plant roses, and a selection from the following varieties may be helpful:—

Standard Roses.

Red Shades.—Crimson Glory, William Orr, Chateau, Etoile de Holland, Rogue Mallerin.

Pink Shades.—Lorraine Lee, Ophelia, Picture, Dame Edith Helen, The Doctor.

Orange Coppery Shades.—Talisman, President Hoover, Margaret McGredy, Angele Pernet, Madame Edouard Herriot.

Yellow Shades.—Golden Dawn, Lady Hillingdon, Golden Emblem, Canary, Julien Potin.

White Shades.—White Ensign, Mrs. Herbert Stevens, McGredy's Ivory, White Mamon Cochet, Frau Karl Druschki.

Climbing Roses.

Red Shades.—Blackboy, Daily Mail Scented, Climbing Hadley.

Pink Shades.—Sunny South, Doris Downes, Climbing Ophelia.

Yellow Shades.—Climbing Fontanelle, Climbing Sunburst, Climbing Golden Dawn.

Autumn Tints.—Climbing Shot Silk, Climbing Talisman, Climbing Madame Edouard Herriot.

Whites.—White Mamon Cochet.

If new rose bushes are required, it is advisable to order them early, as the desired varieties may not be available later in the season. The soil should have been well prepared and, if necessary, drained with underground drains. It would be advisable also to trench and thoroughly lime a heavy soil, but this is not necessary with light soils. Mark out the position for the roses, allowing about 3 feet between the plants. When making the hole, leave a mound in the centre, and on this mound place the rose, so that the roots point downwards. Plant the roses the same depth as they were in the nursery. When planting, first put in the stake to which you are going to tie the rose and then place the rose in position. Half fill the hole and firmly trample the soil and fill up the hole with water. The watering is to get rid of the excess air and to wash the fine particles around the roots. As soon as the water soaks away, fill in the hole and make the soil a little higher than the surrounding area.

Before planting, cut off any bruised roots, and trim back the roots and the branches.

The established plants, except the Wichurianas and evergreens, will require pruning during the winter. June is a good month to carry out this operation. The Wichurianas are pruned after flowering, about October-November, because they flower on the previous season's growth. Pruning in winter would cut off the flowering wood. The evergreens, such as Lorraine Lee, flower throughout the winter, and flowers are too precious to allow the plants to be cut back during that period.

They can be pruned back a little harder than the other garden roses in the early autumn, say February or March, according to the season.

Pruning is carried out to keep the bushes in good shape and to enable them to flower well over a number of years. If they were not pruned, they would become tall and open, with a few flowers at the top. The chief factors to be kept in mind when pruning are to remove all dead, sickly, or weak growths; take out any old wood, and encourage good strong new growths. It is advisable to remove branches growing across the bush to enable more light and sunshine to penetrate, and to shorten back the remaining strong growths to a suitable length. When pruning, always make the cut just above a plump, healthy bud and at an angle to enable the water to run off.

After pruning, give the area around the bushes a good clean up, forking it over and adding a dressing of lime at the rate of 3 to 4 oz. per square yard.

Give the rose bushes a spraying with lime sulphur at the strength of one part of lime sulphur to nine or ten parts of water. This kills any aphis or scale present, and assists in keeping mildew, black spot, and similar fungus diseases in check.

Vegetables.

During the month of June the empty beds should be turned over and left in the rough to allow the frost, air, and water to enter freely and help to sweeten the soil. Give a liberal dressing with lime. It is advisable to half trench the area in which root crops are going to be sown this year. Half trenching is carried out by removing the first spit of soil about 18 inches wide and 16 to 18 inches deep and putting it to one side to be used in filling up the last trench of the bed. The subsoil at the bottom of the trench is worked up and left in the bottom of the trench. The top portion of the next spit is used to fill in the previous trench, and then the subsoil of this trench is treated as indicated above. Continue until the subsoil from the last spit is dug up, and the surface soil from the first spit is then used to complete this last trench. If any farmyard manure is available, place it in each trench after the subsoil has been worked up.

Give the growing vegetables careful attention to see that the area is not waterlogged, and keep the soil well stirred to enable the air to enter freely.

Make further plantings of broad beans and early cabbage, such as Eastham or Enfield Market. Plant early culinary peas such as William Hurst and prepare the area for the main Greenfeast pea crop, to be sown about July-August.

Make a sowing of brown Spanish onions, either where they are going to be grown or, if only a few are to be planted, obtain seedlings and transplant them. The latter method obviates the necessity for weeding and thinning out the young plants. Plant in rows from 12 to 30 inches apart, according to the method of cultivation, and either transplant 6 to 9 inches apart or thin out to that distance between the plants.

Keep a sharp look-out for the cabbage caterpillar and moth. If any grubs appear, dust with arsenate of lead powder or, if the plants are reaching maturity, use one of the Derris Dust preparations. The arsenate of lead is poisonous to humans and must be used carefully.

Factors Affecting Yield of Apples

The number of apples borne on a tree in any year is dependent on (*a*) the number of blossoms which form; and (*b*) the percentage of these blossoms which set and form fruit. In considering the question of biennial bearing, or, in fact, the question of low yield, quite apart from any other considerations, it is essential to keep these two factors quite separate.

Usually biennial bearing is due to the fact that in the light year relatively few blossoms form, while in the heavy year blossoms are excessive.

Consider briefly the case of a tree which blossoms freely, but fails to set a satisfactory crop. This is due probably to faulty pollination, in which case suitable cross pollenizing varieties should be introduced. On the other hand, it may be due to faulty nutrition of the tree. Nitrogen is often the important element for fruit setting, and an application of, say, 3 lb. of some nitrogenous fertilizer such as sulphate of ammonia per tree two or three weeks prior to blossoming, often will improve the set of the fruit.

The Longerenong Agricultural College Piggery

By G. C. GRIFFITHS,
Dairy and Piggery Instructor at the College

CONSIDERABLE attention has been given to pig husbandry at Longerenong Agricultural College, Dooen. The College piggery affords students an opportunity of gaining practical experience in pig raising, both as a commercial undertaking and for stud-pig production.

The piggery is situated on approximately 8 acres of land. There is a central building, comprising finishing pens, weighing yard, washing pens, feed house, and loading ramp. Surrounding the main building are nineteen yards, each with shelter shed, feed and water troughs, and, in the larger yards, self-feeders. As the annual rainfall is insufficient to allow depasturing on these small areas, most of the yards are subdivided for the growth of cereal crops as feed during winter and spring.

General view of piggery yards and buildings, Longerenong Agriculture College.

Barley and wheat grown on the College property provide the bulk of the food supply. This is supplemented by feeding meat meal to the pigs, as there is insufficient separated milk available to supply their protein requirements.

Special yards for farrowing purposes have been constructed. In these yards shelter sheds have been provided with moveable hurdles or farrowing crates.

Feed and water troughs are provided for the sow, and young pigs from the age of four weeks have access to a "creep" self-feeder, in which a balanced ration is dry self-fed. Some indication of the convenient lay-out of the College piggery and the ease of working it may be gained from the amount of labour employed. Two first-term students are engaged every second day in the week, while one second-term boy is able to manage the work on each of the other days. Pens are cleaned daily, fresh straw is added, and the animals given every comfort and attention.

Two breeds of "Whites" are maintained—the Middle and Large Yorkshire. All brood sows are registered in the Stud Book and, on an average, 30 animals are used for breeding purposes. While most of the sows are kept for stud breeding, some of the Middle Whites are mated with the Large White boar for the production of crossbred pigs; these normally are sold as slips or porker stores to local farmers.

The Longerenong stud, for a number of years, has figured prominently at the Melbourne Royal Shows, where considerable success has been achieved in commercial and open sections.

At Longerenong a type that can compete successfully with those produced by other prominent breeders in the State has been evolved. Pigs have not been bred for exhibition purposes only. In each competition slaughtered pigs have proved that carcass quality has been highly developed.

In recent years a strain has been sought after combining productive ability and high milking capacity in the sows plus uniformity and carcass quality in the young stock.

The present herd sire is Promview King 105th (6367), an animal of exceptionally fine bacon type, while Promview King 135th (6957), *ex* Promview Ada (6128) was recently introduced for line breeding with progeny of the older boar.

At Longerenong during the past eighteen months, litter testing of stud litters has been added to the normal work of recording the breeding particulars of each litter. Litters are weighed at birth, again when 28 days old to measure the milking abilities of the dam, and finally on the 56th day from birth, when weaning takes place. It is hoped later to undertake pig recording when two or three pigs will be selected from each litter and brought to their appropriate market condition for slaughter. This will supply information in addition to that already available, and show rate of growth and carcass quality of pigs so produced. Although particulars of litter testing are set out hereunder, they are by no means conclusive. Many of the litters tested are from maiden sows, therefore, in the absence of a formula for making comparisons with mature animals they tend to reduce the average figures. Sufficient information is available, however, to show the trend of the work, and later should prove invaluable to the breeder desiring to select stock.

LITTER RECORDS.

Details.	Middle White Stud.	Large White Stud.
Number of sows recorded	7	16
Number of litters recorded	13	27
Average total births per sow	10·6	10·7
Average live births per sow	8·1	9·6
Average percentage of pigs dead at birth	23·58%	10·28%
Average weight of litters at birth (live pigs only)	21·4 lb.	28·5 lb.
Average weight of each live pig at birth	2·64 lb.	2·96 lb.
Average number in each litter weighed at 28th day	7·2	8·6
Average weight of litters at 28th day	88·6 lb.	124·4 lb.
Average weight of each pig at 28th day	12·3 lb. (= 3·65 times birth weight)	14·4 lb. (= 4·8 times birth weight)
Average increased weight each pig from birth to 28th day	9·66 lb.	11·44 lb.
Average percentage lost from live births to the 28th day	11·11%	10·41%
Average number weighed on 56th day	7·1	8·5
Average weight of litters at 56th day	207 lb.	290·6 lb.
Average weight of each pig on 56th day	29·2 lb. (= 2·37 times weight on 28th day)	34·18 lb. (= 2·37 times weight on 28th day)
Average increased weight between 28th and 56th day	16·9 lb.	19·78 lb.
Average loss from live births to those reared to 56th day	12·34%	11·45%
Average loss from gross births to those reared to 56th day	33·01%	20·56%
Highest individual litter weight at 28th day	119 lb. (litter of 8 pigs)	191 lb. (litter of 13 pigs)
Highest individual litter weight at 56th day	264 lb. (same litter as above)	474 lb. (same litter as above)
Highest average weight per pig at 56th day	35·8 lb. (litter of 6 pigs)	49·8 lb. (litter of 8 pigs)
Lowest individual litter weight at 28th day	80 lb. (litter of 7 pigs)	72 lb. (litter of 6 pigs)
Lowest individual litter weight at 56th day	178 lb. (litter of 7 pigs)	136 lb. (litter of 6 pigs)
Lowest average weight per pig at 56th day	22·7 lb. (litter of 10 pigs)	22·6 lb. (same as above)

NOTES FOR THE HOME

Preserving Apples

By MARY D. WHITE, Assistant Fruit Preserving Expert

FORTUNATELY apples keep well, and, by means of cool storage, can be supplied to the public throughout the year. However, in the country, large quantities of apples are often allowed to spoil when apples are plentiful, no attempt being made to preserve them.

The cheapest method of preserving apples is by drying. Apples are peeled, cored, and sliced into rings by hand or machine and dipped into salt water (two tablespoons salt to 1 gallon water) to prevent discolouring. They may then be sulphured to retain their whiteness, but this is not necessary where fruit is for home use. The rings are then spread on sheets or trays in the sun for three or four days or dried in a cool oven till soft and pliable. The fruit is then allowed to lie in heaps for a day before storing.

Another method is bottling. Select good quality fruit. Peel, core, and cut it into rings or quarters; pack in preserving jars; cover with syrup; then put the jars in a sterilizer or boiler and process (or boil) for 20 minutes. Rhubarb and apple, blackberry and apple, and apple pulp can be prepared and bottled for use in pies, tarts, and purees. Apple sauce can be prepared, bottled and sterilized for use with meats.

Apple juice is fast becoming a popular beverage. It is valuable from a health point of view as well as tasty. The juice contains minerals, antiseptic acid, and is a valuable laxative. "When on an ordinary diet, a glass of apple juice taken first thing in the morning, before retiring at night, and, when desired, between meals, is a very valuable dietetic measure." (Stanley Lief, N.D., D.O., D.C., in *Health for All.*)

The apples are washed, cut in quarters, and the juice extracted by means of a press or a juice extractor. This may be used fresh or it may be bottled. Any bottle with a well-fitting cork can be used, but special fruit juice bottles are very convenient. Sterilize bottles and corks. Strain juice if desired, and fill bottles up to 1-1½ inches from the top. Cover with cork, put on a stand in sterilizer or boiler, pour in cold water up to neck of bottle, and heat to 175°F. Keep at this temperature for half an hour or at 165°F. for one and a half hours. Remove from sterilizer; push cork well in; dip in melted paraffin or sealing wax; cool and store. If using special juice bottles, seal five minutes before removing from the sterilizer.

Preserving jars also may be used for juice. The juice first must be heated to 175°F; the jars are then filled and placed in the sterilizer with water at 175°F. The water is kept at this temperature for half an hour.

When making apple juice, the skins and cores need not be wasted, but can be made into apple jelly. They also may be used to obtain a thick liquid called apple pectin extract by covering with water, boiling gently for half an hour, straining, and boiling to half the volume. This extract is used in making such jellies as mint, fig, raspberry, rhubarb, where the fruit is weak in pectin, the jelly-forming substance. It can be poured hot into sterilized bottles, corked, and sealed with paraffin.

The pulp obtained when apple juice is strained is also useful. It can be used for pies, purees, or other apple dishes, or it can be turned into apple butter, a spread suitable for sandwiches.

Recipes.

Apple Butter.

Wash and slice apples into saucepan (or use pulp from juicing or jelly making). Allow one lemon rind to three apples. Add a little water to prevent burning and cook till tender. Mash through a sieve. Return to saucepan, allowing half cup sugar to one cup pulp. Cook till quite thick and stiff. Put in small glasses or jars and seal or cover with paraffin.

Apple and Grape Butter.

Use equal quantities of grape and apple. Crush grapes. Make as for apple butter, but add no water.

Questions and Answers

The following questions have been received from correspondents and it is considered that the replies will be of general interest.

QUESTION.—I have a 10-acre crop of saccaline. It has come into ear, stands 10 feet high, and is very dense and heavy. Please advise the best way of using this as a fodder. If I leave it standing will it keep as a standby for the winter? Is there any dangerous stage in feeding it, similar to the risk sometimes experienced with ambercane? Is it at any stage suitable for sheep and pigs?

ANSWER.—Saccaline may be reserved for winter feed by allowing it to stand to be cut and fed out to stock as required. Even when the leaves are destroyed by frost it retains much of its feeding quality. Saccaline is a sorghum and, as such, there is a danger of prussic acid poisoning at some stages, but this danger is very remote when the plant has reached the flowering stage. Sheep and pigs as well as cattle will eat it, and sheep even learn to straddle the stalks, bending them to reach the tops. Saccaline makes good silage.

QUESTION.—During the last few weeks my pigs have been dying. Am I entitled to compensation, and, if so, where may it be obtained?

ANSWER.—If pigs are sick or dying from what the owner considers is a disease for which he may claim compensation he should report the matter to the Chief Veterinary Inspector, Department of Agriculture, Melbourne, or to the nearest Inspector of Stock. A visit of inspection will then be made *and compensation will be paid in cases where the Stock Inspector orders the destruction of any of the pigs suffering from a compensatable disease.* Under the provisions of the *Swine Act* 1928 compensation is payable—subject to certain conditions—to the owner of any pig destroyed (by order of any Inspector of Stock pursuant to any Act or any Regulation or order under any Act) because such pig is suffering from or is suspected of suffering from disease. The term "disease" means tuberculosis, swine fever, swine erysipelas, swine plague, or infectious necrotic hepatitis.

QUESTION.—Are apples of any use as feed for a milking cow? My cow eats and seems to enjoy them, and I would like to know if they are any good for milk production.

ANSWER.—With good green succulent pasture apples may be fed with safety to milking cows, but in the absence of such pasture apples should be fed only in conjunction with protein-rich fodders to make a properly balanced ration, otherwise milk yields will tend to diminish rapidly.

QUESTION.—To encourage dehorning, would it be a progressive move to make provision for the exhibition of dehorned cattle at Agricultural Shows?

ANSWER.—Dehorning is a progressive move and would be encouraged if Breed and Agricultural Societies instructed judges not to penalize exhibits if they are dehorned. Such a clause exists in the Friesian Section of the Melbourne Royal Show and at some country Agricultural Shows.

QUESTION.—Would forcing the growth of fine bone by underfeeding the calves and young stock weaken the constitution of the animals?

ANSWER.—Any attempts to grow fine bone by restricting the food supply will result in stunted growth and will definitely tend to weaken the constitution of the stock.

QUESTION.—Would a cow which has been forced to grow fine bone by underfeeding produce as much butterfat as a well-reared cow?

ANSWER.—Cows stunted through attempts to produce fine bone by rearing them on a restricted food supply cannot be expected to produce as much milk and butterfat as well grown ones. Furthermore, well developed, strong boned animals carry a larger reserve of mineral matter which is used during periods when shortages may exist in the food supply.

Standard Herd Records

For Quarter ended 31st March, 1941

In the following is set out the records of all cows which completed a lactation during the quarter. The number is 290, of which 231 qualified for the certificate. The figure in brackets after the owner's name shows the number of entries.

The amount of butter-fat required for qualification varies with the age class to which the animal belongs, the standard being as follows:—

Junior 2-year-old (under 2½ years at time of calving)	230 lb. butter-fat.
Senior 2-year-old (between 2½ and 3 years at time of calving) ..	250 lb. butter-fat.
Junior 3-year-old (between 3 and 3½ years at time of calving) ..	270 lb. butter-fat.
Senior 3-year-old (between 3½ and 4 years at time of calving) ..	290 lb. butter-fat.
Junior 4-year-old (between 4 and 4½ years at time of calving ..	310 lb. butter-fat.
Senior 4-year-old (between 4½ and 5 years at time of calving) ..	330 lb. butter-fat.
Mature cow 5 years and over	350 lb. butter-fat.

(Except where otherwise stated, the period of test was 273 days.)

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Alston, Mrs. N. B. and Sons, Romsey, Jersey (2).										
Rosyth Golden Daffodil ..	Vol. 28	28.5.40	16½	4,634	5·45	252·76	230	Jr. 2	.. ..	Werribee Gaypiece
Rosyth Sweetbread ..	50506	16.4.40	17	6,575	5·38	353·91	350	Mature	235, 264, 291, 300, 509	Aveley Antony
Andrew, W., Whittlesea, Ayrshire (3).										
Glenayr Geum	32396	2.5.40	22½	7,715	4·64	357·92	250	Sr. 2	.. ..	Gladfield Victor
*Kelvin Grove Gay Lass ..	30351	17.6.40	4	5,295	3·92	207·43	350	Mature	250 ..	Kelvin Grove Royalty
Kelvin Grove Magic ..	32642	7.5.40	22	7,068	4·43	313·29	230	Jr. 2	.. ..	Kelvin Grove Lotus Lad 2nd
Atkinson, W. K., Swan Hill, Dairy Shorthorn (4).										
Willow Park Damsel 3rd ..	1265E	18.6.40	28	12,849	4·35	558·71	350	Mature	382, 430, 470, 465, 423	Willow Park Imperial 3rd
Willow Park Duchess 23rd ..	1283E	6.4.40	29	10,930	4·09	446·51	350	Mature	332, 359, 450, 398	Willow Park Silvermine 4th
Willow Park Duchess 35th..	Vol. 2	7.5.40	31	12,078	3·55	429·20	270	Jr. 3	263 ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Duchess 36th ..	Vol. 2	25.4.40	14½	5,553	4·21	233·76	230	Jr. 2	.. ..	Wicklesham Lord Barrington 5th (Imp.)
Austin, F., Lara, Jersey (11).										
Avalon Madeira's Duchess	56188	29.5.40	28	10,116	5·23	529·02	350	Mature	358, 488, 526	Mornmoot Prince Madeira
Avalon Madeira's Pansy ..	60359	19.6.40	12	7,023	4·91	344·76	310	Jr. 4	293, 526 ..	Mornmoot Prince Madeira
Avalon Madeira's Pansy 2nd	60360	1.6.40	27½	9,578	5·47	524·29	290	Sr. 3	471, 433 ..	Mornmoot Prince Madeira
Avalon Madeira's Pansy 11th	70065	31.3.40	10½	4,547	5·45	247·82	230	Jr. 2	.. ..	Mornmoot Prince Madeira
Avalon Madeira's Pansy 13th	70066	6.4.40	21	6,257	5·61	351·29	230	Jr. 2	.. ..	Mornmoot Prince Madeira
Avalon Noble's Pansy 9th ..	47059	25.5.40	19	6,747	5·56	375·46	350	Mature	328, 398, 359, 512, 466	Noble of Avalon
Avalon Starbright's Pansy 3rd	51563	25.6.40	15	7,125	5·41	385·37	350	Mature	360, 482, 543	Brucevale Lord Starbright 3rd
Avalon Starbright's Pansy 4th	56189	4.5.40	19½	8,577	5·53	474·73	330	Sr. 4	341, 452, 522	Brucevale Lord Starbright 3rd
Avalon Starbright's Pansy 5th	56190	27.5.40	17	8,318	5·20	432·68	330	Sr. 4	344, 414, 487	Brucevale Lord Starbright 3rd
Avalon Starbright's Pansy 8th	70068	7.4.40	20½	5,958	5·84	347·99	230	Jr. 2	.. ..	Avalon Starbright 8th
Avalon Starbright's Queen 3rd	70070	24.4.40	16	5,352	6·70	358·40	230	Jr. 2	.. ..	Avalon Starbright 8th
Ballarat Orphanage, Ballarat, Jersey (4).										
Banyule Silvermine 58th ..	29032	4.4.40	20	7,895	5·57	439·52	350	Mature	308, 435, 383, 388	Superstrain of Banyule
Blackwood Grove Miss Leach	37035	5.4.40	18	8,427	5·54	466·73	350	Mature	405, 388, 369	Burnside Harmony
Orphanage Audrey's Molly 5th	54574	27.4.40	20	8,445	5·73	484·15	350	Mature	332, 471 ..	Jerseylea Quality Boy
Orphanage V.C.'s Molly 2nd	41413	29.3.40	26	8,742	5·26	460·23	350	Mature	324, 494, 385	Wompini V.C.
Bennett, J. W., Yinnar, Jersey (3).										
Ellendale Banksia 2nd ..	61414	16.4.40	N.C.K.	8,499	6·58	559·32	350	Mature	.. ..	Lynuilg Mistletoe 2nd's Treasure
Ellendale Bluebell 10th ..	57144	10.4.40	N.C.K.	10,299	5·07	522·63	350	Mature	.. ..	Ellendale Viking
Glen Valley Verbena's Buttercup	40008	17.4.40	N.C.K.	7,427	5·91	438·99	350	Mature	407, 420 ..	Glen Valley Buttermaker's Boy

* 210 days in test.

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Bennett, R. H., Lancefield, Jersey (2).										
Edenhope Lady Tulip ..	71108	18.5.40	15	4,966	5·14	255·41	230	Jr. 2	.. ..	Jindivick Defiance
Edenhope Tulip	61372	21.5.40	20	6,768	5·31	359·45	290	Sr. 3	333 ..	Edenhope Canary's Count
Black, Miss G., Noorat, Jersey (2).										
Noorat Dream Girl ..	73194	10.4.40	13½	4,586	5·60	256·68	230	Jr. 2	.. ..	Belgonia Noella's Peer
Strathkellar Dream Girl 6th	59528	24.6.40	13½	5,081	6·97	353·94	310	Jr. 4	282 ..	Bellefaire Blondes Bellozane
Black Estate, Late J. S., Noorat, Ayrshire (5).										
Mount Noorat Alert 7th ..	31638	30.3.40	12½	7,572	4·24	321·32	250	Sr. 2	.. ..	Gowrie Park Scottish Major
Mount Noorat Boronia ..	20554	13.5.40	25	10,563	4·11	434·33	350	Mature	275, 363, 347, 591, 400	Scottish Fame of Gowrie Park
Mount Noorat Boronia 3rd	29776	12.5.40	12½	8,549	4·19	358·50	330	Sr. 4	328, 410 ..	Scottish Patron of Gowrie Park
Mount Noorat Pyrene 7th ..	30779	26.6.40	16½	7,820	4·36	340·98	290	Sr. 3	392 ..	Scottish Patron of Gowrie Park
Mount Noorat Pyrene 8th ..	31642	13.4.40	11½	4,568	4·72	215·80	230	Jr. 2	.. ..	Strathkellar Banjo
Broad, A. J., Pyramid, Jersey (1).										
Grangelea Rose Petal ..	48526	2.5.40	23½	8,201	5·32	435·99	350	Mature	.. ..	Clarendon Eyre Eminent's Ruddigore 3rd
Bull, S. A., Paschendale, Jersey (1).										
*Glen Leigh Dolly 5th ..	61709	15.6.40	..	4,905	5·49	269·38	250	Sr. 2	.. ..	Selsey Jupiter
Chadderton, J. E., Hamilton, Jersey (3).										
Glen Leigh Damsel ...	52821	3.4.40	16	6,503	5·87	381·75	350	Mature	299, 354, 337	Glen Leigh Bounty
Glen Leigh Daphne 2nd ..	61705	10.4.40	16	6,440	5·52	355·73	290	Sr. 3	370 ..	Selsey Jupiter
Glen Leigh Dawn 3rd ..	57357	17.4.40	15	5,535	6·21	343·82	290	Sr. 3	342 ..	Selsey Jupiter
Clarke, A. B., Glenormiston South, Jersey (2).										
Denniston Blue Bird 4th ..	66208	17.6.40	13	7,460	5·45	406·66	270	Jr. 3	373 ..	Brucevale Lord Fancy 2nd
Denniston Bauhinia 3rd ..	66207	10.4.40	20	5,687	5·91	335·93	250	Sr. 2	.. ..	Brucevale Lord Fancy 2nd
Clarke, F. W., Toora, Jersey (3).										
Mer Vue Babe	C.R.	25.6.40	N.C.K.	8,129	6·16	500·87	330	Sr. 4	322 ..	Woorayl Flashlight
Mer Vue Silver Bell ..	C.R.	20.6.40	N.C.K.	5,720	5·36	306·79	230	Jr. 2	.. ..	Thornbury Grange Romper
Mer Vue Sister	58406	30.3.40	N.C.K.	9,915	5·90	585·43	350	Mature	469, 629, 662	Woorayl Flashlight
Clark, P. W., Whittlesea, Jersey (5).										
Coodardy Centurion's Bell ..	Vol. 28	5.5.40	16	5,286	5·70	301·23	230	Jr. 2	.. ..	Werribee Centurion
Coodardy Centurion's Gloria	70826	10.5.40	14½	6,815	4·46	303·94	250	Sr. 2	269 ..	Werribee Centurion
Coodardy Centurion's Jean	Vol. 28	29.4.40	29½	8,009	4·65	372·21	230	Jr. 2	.. ..	Weeribee Centurion
Coodardy Gloria 8th ..	66016	30.5.40	28½	8,627	4·59	395·56	350	Mature	307 ..	Toorongo Belle's Bonaparte
Coodardy Gloria 9th ..	61159	24.6.40	16	8,117	4·84	393·01	330	Sr. 4	276 ..	Staghorn Lord Aldan 3rd
Clark, W. J., Monomeith, Jersey (1).										
Glenavon May	66604	26.5.40	11	7,983	4·53	361·86	290	Sr. 3	.. ..	Glenavon May Star
Colenso, L. W. R., Alvie, Jersey (15).										
Braemar Lady May ..	43117	1.6.40	14½	5,747	4·73	271·95	350	Mature	.. ..	Avonleigh Sunrise
Normandie Alsyke 3rd ..	68358	14.5.40	12	7,559	4·68	353·61	270	Jr. 3	253 ..	Lewisham Playboy
Normandie Alsyke 4th ..	73201	8.5.40	13½	5,300	4·95	262·43	230	Jr. 2	.. ..	Lewisham Playboy
Normandie Buttercup 2nd	33188	1.6.40	20	7,352	5·56	408·80	350	Mature	317, 486, 412, 447, 475, 375, 337, 330, 441	Peer of Lewisham
Normandie Golden Nancy 3rd	68359	22.5.40	17	6,876	5·89	405·32	270	Jr. 3	383 ..	Normandie Majestic
Normandie Hawthorn 3rd ..	41296	7.6.40	20	7,472	4·54	339·54	350	Mature	284, 327, 351, 331, 339	Peer of Lewisham
Normandie Hawthorn 12th	63438	8.5.40	14	5,864	5·92	346·90	310	Jr. 4	180, 401 ..	Normandie Mayflower's Fancy Masterpiece
Normandie Hawthorn 15th	68361	26.5.40	20	8,259	4·36	359·70	250	Sr. 2	303 ..	Lewisham Playboy
Normandie Hawthorn 16th	73202	18.5.40	12	4,916	5·03	248·98	230	Jr. 2	.. ..	Lewisham Playboy
Normandie Ilma 6th ..	68362	21.4.40	16½	7,529	5·78	435·18	270	Jr. 3	358 ..	Normandie Majestic
Normandie Ilma 7th ..	68363	9.5.40	6	4,839	4·95	239·48	250	Sr. 2	235 ..	Normandie Majestic
Normandie Ilma 10th ..	73203	1.5.40	12	4,478	4·61	206·40	230	Jr. 2	.. ..	Lewisham Playboy
Normandie Mayflower 6th ..	45473	12.6.40	28	9,671	4·73	457·02	350	Mature	274, 416, 384, 293, 444	Normandie Majestic
Normandie Mayflower 11th	68365	13.6.40	6	3,766	6·00	226·11	270	Jr. 3	240 ..	Normandie Majestic
Normandie Primrose 3rd ..	45474	26.4.40	21	8,379	5·67	474·88	350	Mature	280, 335, 325, 279, 305, 444	Peer of Lewisham
Coulthard, J. J., Whittlesea, Jersey (2).										
†Walamba Boronia's Satisfaction	74396	10.6.40	4	2,820	5·73	161·56	250	Sr. 2	292 ..	Selsey Wonderful Boy
†Walamba Lady ..	64779	24.5.40	4	4,395	6·29	276·51	350	Mature	294, 274, 336, 422	Banyule Airo

* 240 days in test (herd withdrawn). † 240 days in test.

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Cowan, G. L. S., Bacchus Marsh, Friesian (1).										
Ingolston Bangle ..	5665	21.6.40	16	8,005	3·82	306·13	330	Sr. 4	.. ..	Ingolston Sylvester
Crawford, Mrs. E., Traralgon, Jersey (2).										
Balniel Master's Idyll ..	65315	8.6.40	N.C.C.	6,050	5·96	360·33	310	Jr. 4	375 ..	Werribee Royal Master
*Balniel Vale Duchess ..	C.R.	23.4.40	4	5,654	4·82	272·38	230	Jr. 2	.. ..	Werribee Valient
De La Rue, N. C., Weering, Jersey (2).										
Glenvalley Coral Sand 5th ..	71542	25.5.40	21	6,284	6·21	389·95	250	Sr. 2	.. ..	Glenvalley Mercedes Chief
Lucerne Vale Madeira 2nd ..	49242	11.5.40	21½	7,100	5·68	420·65	350	Mature	342, 411, 418	Werribee Fancy Masterpiece
Devon Park Stud Farm (G. S. Daley), Lilydale, Jersey (8).										
Clarendon Eyre Emerald Isle 4th	56801	6.5.40	N.C.K.	8,837	4·98	439·65	350	Mature	397 ..	Victorious Pioneer (Imp.)
Clarendon Eyre Tangerine 9th	56813	2.5.40	N.C.K.	9,563	5·16	493·38	350	Mature	375, 446 ..	Victorious Pioneer (Imp.)
Glen Iris Golden Dream ..	57356	14.5.40	N.C.K.	6,171	5·50	339·48	310	Jr. 4	278, 303 ..	Design's Golden Oxford (Imp.)
Karrara Fancy Madeira 2nd	72116	13.6.40	N.C.K.	7,538	5·24	395·20	230	Jr. 2	.. ..	Springhurst Perree's Quality
Karrara Perree's Tangerine	72117	20.5.40	N.C.K.	6,476	4·92	318·32	230	Jr. 2	.. ..	Springhurst Perree's Quality
Karrara Rose Marie ..	72119	27.4.40	13½	5,154	5·73	295·34	250	Sr. 2	.. ..	Springhurst Perree's Quality
Karrara Twylish Tangerine	67357	14.5.40	N.C.K.	6,183	4·90	302·87	270	Jr. 3	216 ..	Sylvandale Twylish Laddie
Springhurst Coronation Yarran	46186	29.4.40	16½	7,575	5·71	432·45	350	Mature	294, 372, 324	Design's Ruler (Imp.)
Dennis, Mrs. A. A., Frankston, Jersey (3).										
Ballam Jeanette	60431	25.6.40	23½	7,076	5·53	391·20	310	Jr. 4	.. ..	Somerville Preference
Ballam Louise	65287	15.4.40	23	6,762	5·29	357·48	230	Jr. 2	.. ..	The Wattle's Gamboge Prince
Ballam Princess	65288	13.5.40	17½	5,109	5·69	290·89	230	Jr. 2	.. ..	The Wattle's Gamboge Prince
Department of Agriculture, Werribee, Friesian (3).										
Victoria Geisha	6084	24.5.40	18	9,584	3·48	333·67	230	Jr. 2	.. ..	Victoria Mikado
Victoria Oxeye	6094	8.6.40	4½	10,185	3·83	389·80	310	Jr. 4	335, 341 ..	Victoria Double Top
Victoria Winsome ..	6102	29.4.40	23½	7,125	3·79	270·12	230	Jr. 2	.. ..	Anama Netherlands Neptune
Department of Agriculture, Werribee, Red Poll (16).										
Victoria Apricot	Vol. 11	29.4.40	16	4,527	4·73	214·08	230	Jr. 2	.. ..	Victoria Ghurka
†Victoria Avocet ..	3892A	5.4.40	..	6,675	3·80	253·74	350	Mature	215, 287, 355, 384, 282, 309	Dominion Bright Belgian
Victoria Band	C.R.	29.4.40	12½	5,895	4·55	268·15	230	Jr. 2	.... ..	Chandpara Valentine
Victoria Bright Bess ..	3898A	22.5.40	24	10,323	4·11	424·44	350	Mature	223, 312, 314, 321, 380, 395	Dominion Bright Belgian
Victoria Greetings ..	Vol. 11	24.4.40	12	6,942	4·63	321·60	230	Jr. 2	.. ..	Chandpara Valentine
Victoria Johanna ..	3912A	15.6.40	24	7,805	4·74	369·69	350	Mature	321, 411, 514, 443	Dominion Bright Belgian
Victoria Kinetica ..	4889A	18.6.40	31	11,973	4·22	504·70	350	Mature	277, 405, 440	Victoria Gallant
Victoria Mary Rose ..	6711AA	26.6.40	23½	10,025	4·35	436·25	290	Sr. 3	319 ..	Chandpara Valentine
Victoria Pan Velvet ..	C.R.	23.6.40	34	8,645	4·73	408·79	230	Jr. 2	.. ..	Woodburn Peter Pan
Victoria Prune	7021A	30.5.40	26	8,592	4·45	382·22	330	Sr. 4	277, 362 ..	Woodburn Peter Pan
Victoria Rosie	Vol. 11	13.5.40	10	3,848	4·96	191·02	230	Jr. 2	.. ..	Chandpara Valentine
Victoria Sicely	Vol. 11	12.5.40	22½	6,218	4·21	261·87	230	Jr. 2	.. ..	Victoria Ghurka
Victoria Snowdrop A ..	Vol. 11	26.4.40	15½	4,991	4·98	248·59	230	Jr. 2	.. ..	Chandpara Valentine
Victoria Snowdrop B ..	Vol. 11	23.4.40	19	6,611	4·18	276·12	230	Jr. 2	.. ..	Chandpara Valentine
Victoria Tambar ..	Vol. 11	29.5.40	26	9,159	4·47	409·86	230	Jr. 2	.. ..	Woodburn Peter Pan
‡Victoria Vellum ..	Vol. 11	29.3.40	4	4,209	4·66	196·23	230	Jr. 2	.. ..	Woodburn Peter Pan
Dookie Agricultural College, Dookie, Ayrshire (1).										
Dookie Patsy	27120	1.4.40	21	8,811	4·10	361·12	350	Mature	381, 457, 409, 449	Dookie Emblem
Ettringham, W. B., Wandin North, Jersey (1).										
Clifford Farm Joan ..	70727	11.4.40	12½	4,778	6·97	333·18	230	Jr. 2	.. ..	Clifford Farm Danny Boy
Enders, N. H., Stanhope, Jersey (1).										
The Wattle's Moleen 4th ..	69345	21.6.40	25	9,432	5·50	518·56	290	Sr. 3	355 ..	The Wattle's Silver Gamboge
Fadersen, J. H., Mandurang, Jersey (3).										
Banyarra Silvermine 3rd ..	51648	25.6.40	N.C.K.	8,859	4·42	391·53	350	Mature	303, 367, 398	Banyarra Velvetation
Banyule Silvermine 89th ..	42891	8.6.40	N.C.K.	7,869	4·77	375·65	350	Mature	305, 336, 332, 410	Oxford Beau's Pretty Oxford (Imp.)
Banyule Silvermine 113th ..	C.R.	1.6.40	N.C.K.	6,345	5·45	345·52	270	Jr. 3	337 ..	Banyule Silvanus
Fairchild and Clutterbuck, Tinamba, Jersey (1).										
Rowallan Silvermine 4th ..	64128	14.6.40	20	8,490	5·14	436·45	270	Jr. 3	400 ..	Banyule Comet

* 253 days in test. † 210 days in test (sold). ‡ 244 days in test.

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields at Butter Fat.	Sire.
Fixter, A., Boisdale, Jersey (4).										
Avonview Doreen ..	6727	18.4.40	14	5,451	5·51	300·55	230	Jr. 2	.. ..	Kentdale Monogram
Avonview Dulcie 3rd ..	3964	18.6.40	25½	9,245	5·43	502·37	350	Mature	370, 419, 469	Avonview Golden Lord
Avonview Golden Daffodil	3966	20.5.40	25	8,133	5·17	420·20	350	Mature	307, 352, 466	Avonview Golden Lord
Avonview Jean	6729	8.5.40	18½	7,338	5·68	416·66	270	Jr. 3	351 ..	Kentdale Monogram
Foster, A. O., Boisdale, Jersey (3).										
Boisdale Fay	C.R.	29.3.40	14	3,372	6·14	207·07	230	Jr. 2	.. ..	Boisdale Masterpiece
*Boisdale Goldfinch 2nd ..	56433	20.6.40	4	3,758	5·61	212·03	350	Mature	168, 235, 293	Wompini Master Grey
Boisdale Hazel 2nd ..	65511	30.4.40	9	4,332	5·23	226·56	290	Sr. 3	223 ..	Wompini Master Grey
Gay, R. G. and Son, North Devon, Jersey (2).										
Elm Grove La Monte ..	C.R.	4.4.40	19	5,429	4·00	266·13	230	Jr. 2	.. ..	Glen Iris Golden Man
Elm Grove Veronique ..	57177	17.4.40	18	7,029	6·27	440·95	350	Mature	223, 323, 416	Elm Grove Starlight
Grice, C. S., Somerville, Jersey (2).										
Banyule Silvermine 99th ..	51658	2.6.40	22½	9,239	5·95	549·29	330	Sr. 4	331, 418 ..	Banyule Triplane
Grangelea Bunty 7th ..	53016	14.6.40	20	7,440	5·92	440·69	350	Mature	358, 326 ..	Banyule Macon
Harvey, T., Boisdale, Jersey (2).										
Jerseyholm Bluebell 32nd ..	62304	23.5.40	N.C.K.	5,315	5·37	285·37	290	Sr. 3	377 ..	Jerseyholm Master's Fox 35th
Jerseyholm Bluebell 44th ..	67191	6.4.40	13½	5,156	4·75	244·94	230	Jr. 2	.. ..	Orphanage Molly's Commander
Henderson, W., Grasmere, Ayrshire (5).										
Carracoorte Bonnie 8th ..	Vol. 33	13.5.40	8	3,786	4·50	170·28	250	Sr. 2	.. ..	Carracoorte St. Bernard
*Carracoorte Fennella 20th	27010	9.6.40	4	5,700	4·38	249·01	350	Mature	286, 282, 221	Carracoorte Panic
Carracoorte Palm 6th ..	32079	31.5.40	13	5,604	4·37	244·85	310	Jr. 4	289 ..	Grand View Bernie
Carracoorte Viola 38th ..	Vol. 33	1.5.40	5½	4,540	4·87	221·11	250	Sr. 2	.. ..	Carracoorte Brownie's Bell Boy
Jennewar Violetta ..	Vol. 33	22.5.40	10	5,183	4·33	224·35	250	Sr. 2	.. ..	Denbigh Ace
Hodgins, G. E., Hastings, Jersey (2).										
Verjean Veva	69539	16.6.40	16½	7,233	4·89	353·42	270	Jr. 3	.. ..	Jorian Great Boy
Verjean Vontorson ..	74369	16.6.40	16	6,492	5·25	340·80	230	Jr. 2	.. ..	Jorian Great Boy
Hore, E., Leitchville, Jersey (8).										
Milvue Cariad	72836	11.6.40	16	5,460	5·11	279·22	250	Sr. 2	.. ..	Belgonia Suspense's Design
Milvue Design's Honesty 2nd	63099	16.6.40	20	8,055	5·62	452·47	290	Sr. 3	336, 406 ..	Belgonia Suspense's Design
Milvue Design's Larkspur ..	63100	5.6.40	18	7,596	5·88	446·56	290	Sr. 3	396, 394 ..	Belgonia Suspense's Design
Milvue Design's Larkspur 2nd	72842	16.6.40	14	5,781	4·65	268·71	230	Jr. 2	.. ..	Belgonia Suspense's Design
Milvue Design's Rosemary	72846	26.6.40	17	5,721	4·60	263·09	230	Jr. 2	.. ..	Belgonia Suspense's Design
Milvue Eminent's Bettwys..	63101	10.6.40	16½	7,563	4·57	345·75	290	Sr. 3	264, 342 ..	Clarendon Eyre Eminent's Boomerang 4th
Milvue Oxford's Queen ..	63102	20.5.40	17	7,518	5·24	393·95	290	Sr. 3	278, 241 ..	Belgonia Suspense's Design
Milvue Perree's Dainty ..	63103	10.6.40	18½	8,889	4·63	411·90	290	Sr. 3	244, 324 ..	View Banks Perree's Boy
Hore, L. G., Horfield, Illawarra Shorthorn (3).										
Horfield Daisy 10th ..	Vol. 8	1.6.40	5	6,022	4·04	243·26	250	Sr. 2	.. ..	Hillview Reliance
Horfield Dot 3rd ..	25820	4.6.40	6	5,760	3·69	212·59	290	Sr. 3	.. ..	Hillview Reliance
Horfield Viola 5th ..	C.R.	20.3.40	4½	2,954	3·29	97·04	230	Jr. 2	.. ..	Alne Bank Artillery
Hore, M. T., Horfield, Friesian (6).										
Elmar Ideal Patch ..	3973	20.4.40	40	14,738	2·93	431·53	350	Mature	320, 377, 431, 337, 298	Greenvale Oakwood Posch
Elmar Lassie	C.R.	15.4.40	40	16,151	3·53	570·25	330	Jr. 4	298, 381 ..	Elmar Sylvia's Lad
Elmar Patty	C.R.	17.4.40	31½	9,555	2·90	277·25	250	Sr. 2	.. ..	Burnbank Iona Rock
Elmar Plaid	C.R.	13.4.40	30	9,739	2·82	274·55	230	Jr. 2	.. ..	Elmar Sylvia's Lad
Elmar Rosebud	C.R.	7.5.40	27	8,535	3·05	260·61	230	Jr. 2	.. ..	Burnbank Iona Rock
Elmar Ruby	C.R.	20.4.40	25	10,515	3·16	331·78	230	Jr. 2	.. ..	Burnbank Iona Rock
Hubbard Estate, late A., Yarra Glen, Ayrshire (6).										
Emoh Ruo Daphne 2nd ..	27147	1.5.40	12	7,724	3·93	303·75	350	Mature	.. ..	Oakbank Renew
†Emoh Ruo Daffie ..	Vol. 33	25.6.40	..	8,160	3·73	304·29	290	Sr. 3	.. ..	Fulham Fun
Emoh Ruo Dolly ..	Vol. 33	3.5.40	4	5,772	4·21	243·04	250	Sr. 2	.. ..	Fulham Fun
Emoh Ruo Millie ..	Vol. 33	21.4.40	13	7,265	4·43	322·08	250	Sr. 2	.. ..	Fulham Fun
Emoh Ruo Modern 2nd ..	C.R.	23.5.40	4	4,838	4·04	195·45	250	Sr. 2	.. ..	Fulham Fun
The Valley Peeress ..	28900	2.5.40	21	7,463	3·75	279·93	350	Mature	.. ..	The Valley Bandolier
Huffer, J. A., Gormandale, Jersey (2).										
Glenvalley Handsome Duchess	66695	8.6.40	11	5,228	6·44	336·55	270	Jr. 3	397 ..	Glenvalley Aristocrat
Glenvalley Silvershine 4th ..	C.R.	24.5.40	6	4,373	5·83	254·89	230	Jr. 2	.. ..	Glenvalley Coral Hero

* 240 days in test. † 240 days in test (sold).

STANDARD HERD RECORDS—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Hurrey, Estate of late W. H., Koonwarra, Jersey (3).										
Burwood Cream Belle 5th	60928	3.5.40	23	6,432	5·78	371·93	330	Sr. 4	299, 334	Kooreena Handsome Lad
Kooreena Dainty Maid	C.R.	29.3.40	N.O.C.	4,988	5·12	255·41	230	Jr. 2	..	Kooreena Good Luck
Kooreena Maranta 16th	62629	29.3.40	N.O.C.	6,068	6·20	376·27	330	Sr. 4	367, 398	Kooreena Carrie 3rd's Halo
Hutchison, H. McD., Yan Yean, Jersey (1).										
Eulomo Fancy Duchess	71239	7.5.40	N.O.C.	6,903	5·41	373·74	290	Sr. 3	308	Melrose Outlook
Jeffreson, E. L., Narre Warren, Jersey (1).										
Barrowby Rose Midget	65357	9.6.40	16½	7,635	5·71	435·63	250	Sr. 2	340	Mornmoot Meteor
Jones, A. C., Barnawartha, Illawarra Shorthorn (3).										
Coraldale Scarlet 8th	16049	8.4.40	9	5,562	4·12	229·17	350	Mature	..	Berry Ignatius
The Forest Ruby 4th	22772	2.4.40	9½	5,609	4·41	247·29	350	Mature	282	Despatch of the Forest
Wangoola Shamrock 3rd	28460	6.5.40	13	7,243	4·29	310·46	330	Sr. 4	260	Mayfield Gold Digger
Langlands, F. B., Horsham, Jersey (1).										
Brierwood Speedwell's Maid	C.R.	24.6.40	17	5,886	4·91	288·85	230	Jr. 2	..	Murona Twylish
Le Noury, E., Werribee South, Guernsey (2).										
Werribee Happy Maid	8087	4.6.40	N.C.K.	3,645	4·53	164·99	230	Jr. 2	274, 351	Werribee Prince Don
Werribee Souvenir	8091	14.6.40	N.C.K.	6,494	4·94	321·04	290	Sr. 3	274, 351	Yarraview Commander
Longerenong Agricultural College, Docer, Ayrshire (6).										
Longerenong Acacia Elata	26544	18.6.40	N.O.C.	6,552	4·33	283·54	350	Mature	204, 192, 249, 259, 200, 282, 292	Longerenong Baron
Longerenong Acacia Elata 5th	30753	27.4.40	9	6,417	4·44	285·12	270	Jr. 3	..	Dookie Punch
Longerenong Cedar Wattle 5th	30755	17.5.40	12½	6,221	4·21	262·18	290	Sr. 3	..	Longerenong Hero
Longerenong Cootamundra Wattle 5th	31617	22.5.40	18½	6,545	4·35	284·55	250	Sr. 2	..	Longerenong Hero
Longerenong Laurustine 4th	31619	29.5.40	11	5,163	3·95	203·73	250	Sr. 2	..	Dookie Punch
Longerenong Palm 4th	29742	30.4.40	12	7,581	4·06	307·46	330	Sr. 4	239, 310	Dookie Punch
Lyon, C. G., Heidelberg, Jersey (7).										
*Banyule Ettie 20th	65342	20.5.40	..	3,945	5·89	232·32	230	Jr. 2	..	Banyule Oriel
Banyule Hawthorn 21st	56253	10.4.40	23½	8,970	4·89	439·08	270	Jr. 3	449	Banyule Oxford Don
Banyule Silvermine 123rd	65346	20.4.40	15	4,667	5·64	263·17	230	Jr. 2	..	Banyule Monoplane
Banyule Silvermine 127th	70190	25.4.40	18½	5,719	5·87	335·54	230	Jr. 2	..	Banyule Double Purple
Banyule Tiddlewinks 26th	56270	25.4.40	21	7,974	5·78	460·79	270	Jr. 3	511	Banyule Oxford Don
*Banyule Tiddlewinks 30th	60506	17.5.40	..	5,018	5·31	266·47	250	Sr. 2	..	Banyule Oxford Don
Banyule Tiddlewinks 31st	65348	26.4.40	16½	6,006	4·43	266·36	230	Jr. 2	..	Banyule Oriel
Lyon, W. H., Sale, Jersey (8).										
Avon Berenice	C.R.	1.4.40	N.C.K.	5,336	5·36	285·86	230	Jr. 2	..	Avon Ruby's Count
Avon Blue Bell	Vol. 28	23.6.40	N.C.K.	4,229	5·38	227·36	270	Jr. 3	..	Ruby's Beau (Imp.)
Avon Daphne 8th	47068	8.4.40	N.C.K.	6,701	4·86	325·58	350	Mature	305, 397	Avon Lassie Fowler's Count
Avon Delysia	Vol. 28	24.5.40	13	4,979	5·04	249·78	230	Jr. 2	..	Ruby's Beau (Imp.)
Avon Jasmine	Vol. 28	17.6.40	N.C.K.	7,635	5·73	437·64	270	Jr. 3	..	Ruby's Beau (Imp.)
†Avon Lotina	Vol. 28	24.5.40	4	3,015	5·17	155·89	230	Jr. 2	..	Avon Ruby's Count
Avon Mignonette	60367	23.5.40	N.C.K.	5,839	4·92	287·28	350	Mature	289	Ruby's Beau (Imp.)
Studleigh Harebell 16th	50708	23.6.40	N.C.K.	4,029	4·62	186·17	350	Mature	259, 294, 324	Bellifaire Blonde's Blondex
McErvale, I. and Sons, Camperdown, Jersey (3).										
Cumnock Astra 2nd	61238	1.5.40	18	6,275	5·12	321·21	350	Mature	..	Cumnock Fancy Masterpiece
Cumnock Christobel	C.R.	25.4.40	18	6,351	5·33	338·51	250	Sr. 2	..	Cumnock Governor Genera
Cumnock Cinnamon	57025	10.5.40	14½	5,088	5·55	282·15	350	Mature	242, 274	Wompini Grandmaster
McNabb, G. A. and Son, Irrewillipe East, Jersey (11).										
Avalon Madeira's Pansy 6th	65234	9.5.40	N.C.K.	8,081	5·96	481·27	270	Jr. 3	444	Mornmoot Prince Madeira
Maxon Bright Favourite 2nd	58343	9.5.40	N.C.K.	7,298	5·40	394·19	330	Sr. 4	270, 331	Maxon Starbright's Prince 5th
Maxon Chieftain's Alsyke 2nd	54015	9.5.40	N.C.K.	7,188	5·56	399·79	350	Mature	327, 338, 426	Maxon Chieftain
Maxon Chieftain's Bell	58345	3.5.40	N.C.K.	6,833	5·29	361·70	350	Mature	225, 291	Maxon Chieftain
Maxon Chieftain's Comfrey 2nd	54016	9.6.40	N.C.K.	6,789	5·17	351·33	350	Mature	201, 329, 284, 335	Maxon Chieftain
Maxon Chieftain's Lodestone 2nd	58347	2.4.40	N.C.K.	7,668	5·93	454·53	330	Sr. 4	314, 325, 388	Maxon Chieftain
Maxon Count's Lodestone	40932	26.4.40	N.C.K.	6,888	6·09	419·52	350	Mature	341, 356, 360, 416, 468, 372	Maxon Count Graceful
Maxon Count's Ranunculus	58352	4.5.40	N.C.K.	6,914	5·76	398·05	350	Mature	321, 360, 423	Maxon Count Graceful
Maxon Graceful Duchess 4th	63001	30.5.40	N.C.K.	7,553	6·47	489·03	290	Sr. 3	230	Maxon Chieftain
Maxon Noble's Alsyke	34221	6.6.40	N.C.K.	9,095	5·50	500·54	350	Mature	268, 421, 412, 459, 401, 508, 452	Avalon Noble 8th
Maxon Noble's Ranunculus 2nd	67854	12.4.40	N.C.K.	7,242	6·13	443·71	270	Jr. 3	400	Maxon Duchess' Noble

* 240 days in test (sold). † 240 days in test.

STANDARD HERD RECORDS—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Mason, V. J., Ferntree Gully, Guernsey (2).										
Road's End Jeanne ..	4803	17.4.40	26	8,324	5·62	467·58	350	Mature	.. ..	Glenburnie Ideal (Imp.)
Road's End Patrice ..	4805	7.5.40	25	8,835	5·49	484·62	350	Mature	.. ..	Glenburnie Ideal (Imp.)
Meaklin Bros., Mooroopna, Dairy Shorthorn (1).										
Drumneil Nellie 2nd ..	778E	26.6.40	22½	8,686	4·23	367·58	350	Mature	338, 373, 327	Drumneil Bounty 2nd
Methodist Central Mission, Tally Ho, Guernsey (1).										
Melbourne Golden Waterlily	7428	6.4.40	14	5,352	4·55	243·45	230	Jr. 2	.. ..	Nundorah Daredevil
Mitchell, R. H., Linton, Jersey (2).										
Clifford Farm Echo ..	65958	9.4.40	18½	6,773	5·68	384·85	250	Sr. 2	.. ..	Clifford Farm Danny Boy
Clifford Farm Lorraine ..	56819	23.6.40	11	6,633	5·29	350·73	330	Sr. 4	173 ..	Wompini V.C.
Moore J. and Co., Yarram, Jersey (7).										
Tooloonook Molly 11th ..	59757	24.4.40	13	5,321	4·58	244·02	350	Mature	240, 269, 289	Tooloonook Angler's Hero
Tooloonook Molly 12th ..	59758	9.4.40	N.C.K.	6,086	4·60	279·96	350	Mature	256, 241, 322	Anfield Diadem's Masterpiece
Tooloonook Molly 17th ..	Vol. 28	6.5.40	N.C.K.	5,027	4·43	222·79	250	Sr. 2	.. ..	Tooloonook Sanfoin's Hero 3rd
*Tooloonook Sanfoin 3rd ..	50888	17.5.40	4	3,315	4·52	149·68	350	Mature	245, 248, 262, 270	Heroic of Somerville
*Tooloonook Sanfoin 6th ..	69401	4.4.40	4	3,210	4·89	156·95	290	Sr. 3	277 ..	Latrobe Musician
Tooloonook Trixie 26th ..	74218	15.4.40	N.C.K.	2,786	4·21	117·30	230	Jr. 2	.. ..	Belgonia Lady's Duke
Tooloonook Trixie 29th ..	74219	4.4.40	N.C.K.	2,648	4·81	127·24	230	Jr. 2	.. ..	Belgonia Lady's Duke
Nash, L., Rye, Jersey (2).										
Devon Glen Eucalyptus ..	71018	25.4.40	16	6,125	4·75	290·87	230	Jr. 2	.. ..	Selsey Right Royal
Devon Glen Little Queen ..	71019	15.5.40	18	6,872	4·84	332·57	230	Jr. 2	.. ..	Ashcombe Hero
Nicholas, M. A., Sherbrooke, Jersey (2).										
Selsey Cute Wyandotte ..	69058	15.5.40	17½	5,132	6·38	327·47	250	Sr. 2	327 ..	Samare's Golden Prince (Imp.)
Selsey Tally 2nd	69073	15.6.40	16½	5,649	5·26	297·09	250	Sr. 2	.. ..	Brampton Sporting Standard (Imp.)
Noble, T. M. and Sons, Maffra, Jersey (4).										
Finchley Handsome Lady 2nd	43886	14.6.40	N.C.K.	6,879	6·60	453·87	350	Mature	276, 415, 480, 504, 445, 491	Finchley Lord Harmony
Finchley Handsome Lady 4th	71315	20.6.40	N.C.K.	5,325	6·56	349·31	230	Jr. 2	.. ..	Finchley Vasilika's Masterpiece
Finchley Master's Bluebell..	66460	10.6.40	19½	8,659	5·58	483·43	270	Jr. 3	473 ..	Finchley Masterman
Finchley Vasilika 4th ..	71321	21.6.40	N.C.K.	5,447	5·98	325·91	230	Jr. 2	.. ..	Finchley Vasilika's Masterpiece
O'Neill, J., Echuca Village, Jersey (2).										
Fourshell's Yvette ..	38349	23.5.40	21	7,701	5·09	392·09	350	Mature	490, 436, 405, 374, 365, 374	Belgonia Propeller
Ullina Bessie	74309	24.6.40	18	5,109	5·71	291·48	230	Jr. 2	.. ..	Melrose Outlook
Parker, L. M., Tallarook, Dairy Shorthorn (8).										
Deep Dale Dainty ..	Vol. 2	1.6.40	24	9,539	3·74	356·77	310	Jr. 4	.. ..	Willow Park Banker 3rd
Deep Dale Daphne ..	Vol. 2	8.4.40	28	11,678	3·76	438·71	350	Mature	.. ..	Willow Park Banker 3rd
Deep Dale Fairy	Vol. 2	9.4.40	28	8,190	3·63	297·12	250	Sr. 2	.. ..	Willow Park Banker 3rd
Deep Dale Gem	Vol. 2	19.6.40	21½	8,052	4·02	323·95	290	Sr. 3	.. ..	Willow Park Banker 3rd
Deep Dale Pearl	Vol. 2	6.4.40	22	9,714	4·16	403·72	350	Mature	.. ..	Willow Park Banker 3rd
Deep Dale Rachel ..	Vol. 2	4.4.40	15½	8,426	3·71	312·42	310	Jr. 4	.. ..	Willow Park Banker 3rd
Deep Dale Star	Vol. 2	31.3.40	18½	7,218	4·14	298·73	250	Sr. 2	.. ..	Willow Park Banker 3rd
Deep Dale Strawberry ..	Vol. 2	9.4.40	19	5,961	3·89	231·84	230	Jr. 2	.. ..	Willow Park Barrington 26th
Parks L. A. and Sons, Romsey, Guernsey (1).										
Melbourne Golden Gem ..	4501	23.4.40	10½	7,977	4·78	381·15	350	Mature	263, 334, 299, 327, 480	Nundorah Climax
Parkes, E. F., Merton, Jersey (1).										
*Irona Benedictine ..	Vol. 28	28.5.40	4	3,517	5·05	177·69	230	Jr. 2	.. ..	Irona Cute Boy
Payne, A. E. T., Lilydale, Guernsey (4).										
Yarraview Beryl ..	8197	30.4.40	32	10,856	5·16	559·91	290	Sr. 3	485 ..	Honoria's Benefactor (Imp.)
Yarraview Charlotte ..	8198	30.5.40	23	8,475	5·76	488·46	270	Jr. 3	405 ..	Yarraview Clarion
Yarraview Citron ..	3550	12.4.40	16½	9,245	4·88	450·98	350	Mature	345, 360, 663, 599	Woodland's Fleur-de-Lys (Imp.)
Yarraview Essie	5169	15.4.40	30	11,988	4·28	512·98	350	Mature	292, 346, 583, 510	Camilla's Majestic of Maple Lodge (Imp.)
Phillips, J. H., Swan Hill, Jersey (2).										
Ellimeek Mayflower ..	71177	8.6.40	9	5,403	4·50	242·99	230	Jr. 2	.. ..	Ryeland's Gordo
Ryelands Dainty Maid ..	64159	26.6.40	27	8,355	4·56	381·17	330	Sr. 4	267, 369, 419	Ryeland's Black Prince

* 240 days in test.

STANDARD HERD RECORDS—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Powell, T. S., Mansfield, Jersey (2).										
Carellen Melody	70642	16.4.40	18½	4,969	5·86	290·94	230	Jr. 2	.. ..	Werribee Madeira's Ace
Mornmoot Northwood Madeira 3rd	41129	5.4.40	25½	8,184	5·28	432·27	350	Mature	450, 365, 458	Werribee Prince Madeira
Read, Estate of late J. D., Springhurst, Jersey (16).										
Springhurst Anemone's May	64268	10.4.40	20½	8,701	4·64	403·72	270	Jr. 3	298 ..	Glen Iris Anemone's Standard
Springhurst Ashley Narcissus	69122	4.4.40	14½	5,595	5·20	290·91	230	Jr. 2	.. ..	Twin Oaks Ashley Fern's Noble (Imp.)
Springhurst Ashley Tecoma	69123	9.4.40	16	6,068	4·54	275·40	230	Jr. 2	.. ..	Twin Oaks Ashley Fern's Noble (Imp.)
Springhurst Ashley Tomato	69124	30.3.40	9½	3,890	6·14	238·70	230	Jr. 2	.. ..	Twin Oaks Ashley Fern's Noble (Imp.)
Springhurst Ashley Tulip ..	69125	10.4.40	9½	4,367	5·21	227·37	230	Jr. 2	.. ..	Twin Oaks Ashley Fern's Noble (Imp.)
Springhurst Blonde Nardoo	59485	12.4.40	19	7,152	6·27	448·29	310	Jr. 4	318, 488 ..	Bellefaire Seaborn Successor
Springhurst Blonde Nightshade	59486	22.4.40	27	9,596	5·24	503·12	310	Jr. 4	338, 496 ..	Bellefaire Seaborn Successor
Springhurst Blonde Romneya	55272	13.4.40	20½	8,177	5·67	463·33	350	Mature	377, 399, 523	Bellefaire Seaborn Successor
Springhurst Boutillere ..	64270	5.4.40	14	7,836	5·41	424·11	250	Sr. 2	336 ..	Glen Iris Anemone's Standard
Springhurst Brampton Tulip	64274	23.4.40	7½	5,375	4·90	263·37	250	Sr. 2	281 ..	Glen Iris Anemone's Standard
Springhurst Coronation Narcissus	50625	9.6.40	26	10,758	5·44	584·75	350	Mature	317, 428, 429, 519	Springhurst Design's Analyst
Springhurst Glad Brinjal ..	64277	30.4.40	22	7,470	5·10	380·65	270	Jr. 3	359 ..	Springhurst Sybil's Successor
Springhurst Pet Tomato ..	64282	11.5.40	20	8,752	4·68	409·42	270	Jr. 3	344 ..	Glen Iris Anemone's Standard
Springhurst Ronald's Alsyke	59498	17.4.40	12	6,801	6·40	435·08	290	Sr. 3	365, 545 ..	Bellefaire Seaborn Successor
Springhurst Socurette's Lily	69129	30.3.40	16	6,714	4·80	321·95	230	Jr. 2	.. ..	Bellefaire Superlative Pride
Springhurst Sybil Tulip ..	55281	22.6.40	19½	7,595	5·93	450·32	350	Mature	329, 425, 492, 513	Springhurst Golden Gamboge
Ronalds, O., Tarago, Jersey (1).										
Jindivick Buttercup ..	48872	1.5.40	16	6,527	5·52	360·60	350	Mature	481 ..	Somerville Master Babs
Salesian College, Sunbury, Friesian (1).										
Glenloth Amelia	C.R.	30.4.40	26½	9,647	3·30	318·80	350	Mature	.. ..	Road's End Cato
Shearn, J., Jindivick, Jersey (3).										
Carellen Larkspur 2nd ..	70640	26.4.40	14	4,437	5·45	241·63	230	Jr. 2	.. ..	Mornmoot Magistrate 2nd
Somerville Heroine 12th ..	69103	6.5.40	12	4,598	4·85	222·78	270	Jr. 3	.. ..	Brampton Pioneer Chief (Imp.)
Somerville Rio Rita 9th ..	69104	19.5.40	12	5,127	6·00	307·45	270	Jr. 3	283 ..	Brampton Pioneer Chief (Imp.)
Smith Bros., Mirboo North, Jersey (1).										
Sylvan Hill Golden Tissue ..	69187	1.6.40	11½	5,908	4·97	293·87	290	Sr. 3	251 ..	Glen Iris Bow Bells
Smith, C. G., Pakenham, Jersey (2).										
Kantara Ditney's Larkspur	29378	25.6.40	14½	7,499	5·96	446·68	350	Mature	323, 407, 426, 479, 375	Ku Ku Fashion Plate (Imp.)
Wonga Park Lady Jess ..	69761	10.5.40	23	8,196	5·43	444·98	270	Jr. 3	.. ..	Wonga Park Minx's Ace
Tait, W. G., Dreslte, Jersey (4).										
Stonybank Jessie 2nd ..	64308	20.5.40	13½	5,895	5·41	318·69	350	Mature	328, 421 ..	Lucerne Vale Trixie's Masterpiece
Stonybank Jessie 5th ..	73961	2.4.40	12	5,802	5·72	331·69	230	Jr. 2	.. ..	Mornmoot Marius 2nd
Stonybank Snowdrop 2nd ..	50656	8.6.40	11½	5,450	5·95	324·34	350	Mature	420, 497 ..	Melrose Curio
Stonybank Snowdrop 5th ..	73964	23.4.40	12½	5,244	5·49	288·13	230	Jr. 2	.. ..	Mornmoot Marius 2nd
Tomasetti, B. G., Drouin West, Ayrshire (1).										
Glencorren Belle	28444	16.4.40	14	8,040	4·68	376·02	350	Mature	268, 349, 372, 419	Gowrie Park Scottish Emblem
Vagg, E. J., Leongatha, Jersey (1).										
Bonnay Queen's Dulcie ..	56466	31.3.40	16½	5,428	6·09	330·56	350	Mature	286, 358, 339	Jerseyinn Edith's Masterpiece
Vaughan Bros., Girgarre, Jersey (1).										
Lynroy Lady Glossy ..	72574	3.6.40	N.O.K.	8,701	5·28	459·82	270	Jr. 3	307 ..	Werribee Laverock
Wade, W. J., Stratford, Jersey (1).										
Inverbroom Bunty's Empress	57760	28.5.40	N.O.K.	7,229	4·72	341·43	330	Sr. 4	297, 438 ..	Grangelea Butter Boy 3rd
Walker, C. S., Swan Hill, Friesian (4).										
Warwick Canary Walker ...	C.R.	14.6.40	40	12,890	3·43	441·77	230	Jr. 2	.. ..	Hengest Matador Walker
Warwick Leonora Walker ..	Vol. 15	21.5.40	35	13,946	2·87	400·16	350	Mature	259, 349, 521	Hengest Matador Walker
Warwick Lizzie Oakwood ..	6104	6.5.40	43	20,601	3·00	617·28	350	Mature	302, 487, 532	Hengest Lizzie Segis
Warwick May Walker ..	C.R.	11.6.40	39½	13,403	2·64	353·98	230	Jr. 2	.. ..	Hengest Matador Walker

STANDARD HERD RECORDS—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Walker, C. S., Swan Hill, Jersey (5).										
Grangelea Golden 5th ..	66757	25.5.40	15	6,573	5·12	336·28	310	Jr. 4	251, 341 ..	Grangelea Prosper 5th
Warwick Augustus Marie 7th	69626	16.5.40	17	7,342	5·02	370·36	250	Sr. 2	.. ..	Warwick Golden Lord
Warwick Beauty 9th ..	74448	19.4.40	N.O.C.	7,186	4·98	358·04	230	Jr. 2	.. ..	Warwick Golden Lord
Warwick Cream Stockings 6th	C.R.	7.6.40	15	6,612	4·99	329·91	230	Jr. 2	.. ..	Warwick Golden Lord
Warwick Polly 11th ..	74450	28.4.40	17	5,586	4·76	265·69	230	Jr. 2	.. ..	Warwick Golden Lord
Wallace, A., Dingee, Jersey (1).										
Grovelea Ranger's Bloom ..	66861	3.4.40	N.C.K.	2,951	4·84	142·82	290	Sr. 3	.. ..	Orphanage Ranger
Waterhouse, J. W. and Son, Pakenham, Jersey (3).										
Navuloa La Harebell ...	73097	7.5.40	20½	6,528	5·33	347·84	230	Jr. 2	.. ..	Staghorn Laburnum Masterpiece
Navuloa Master's Fancy ..	63363	24.5.40	12½	8,529	5·59	476·47	290	Sr. 3	.. ..	Werribee Grandmaster
Willis Vale Brigadier's Magnet	42509	9.5.40	23¼	9,147	5·63	514·60	350	Mature	.. ..	Clarendon Eyre Eminent's Brigadier
Watson, K. E., Pakenham Upper, Jersey (1).										
Arranmore Gipsy's Pearl ..	C.R.	19.6.40	12½	5,438	5·26	286·15	230	Jr. 2	.. ..	Goronga Farm Skylark
Whelpton, B., Whittlesea, Jersey (1).										
Wattle Grove Jeanette 2nd	55801	6.5.40	34	8,049	5·33	428·72	350	Mature	.. ..	Fairview Chief

To Combat Wine Diseases

By D. G. QUINN, Government Viticulturist

THE 1941 vintage throughout Victoria has been relatively light owing to droughty conditions in the winter and early summer of last year.

The yield was improved by frequent rains during January and February, and although mouldiness was expected, it did not eventuate.

The wines will be lighter than usual this year and growers are accordingly warned to take greater care than is ordinarily necessary to prevent the beverage types from suffering from the action of the Vinegar Ferment.

There is another very slow bacterial action to which practically all wines are subject, caused by organisms of the genus *Lactobacillus*. As this is the chief cause of unsoundness in Australian wine, a brief explanation of the action may be useful.

After the completion of the yeast fermentation, all wines contain at least traces of sugar. These bacteria absorb this sugar as food; and CO_2, mannite, acetic, and lactic acids are the excretory products.

The loss of the last traces of sugar in a dry wine reduces its mellowness, and the rising bubbles of CO_2 will not permit clarification by sedimentation. Also the presence of an excess of acetic acid in any wine is ruinous. Fortification with alcohol will not prevent this secondary fermentation, but sulphur dioxide, to the extent of 1 part in 10,000, is effective. Wine stored in hogsheads will completely lose this added dose of volatile preservative within twelve (12) months, and the accurate routine adoption of this method of preventing bacterial spoilage may be counted upon to raise the status of Australian wines generally.

Technical details connected with this subject may be obtained by application to the Viticulturist, Viticultural Research Station, Department of Agriculture, Rutherglen.

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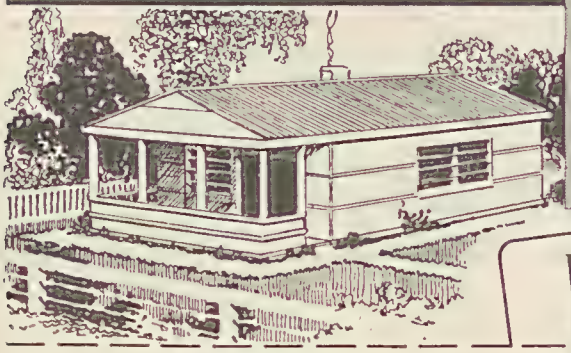

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The Journal of the DEPARTMENT of AGRICULTURE of VICTORIA

Journal of Agriculture, Victoria—July, 1941.

Pasture Improvement IN THE WESTERN DISTRICT

By R. L. TWENTYMAN, B.Agr.Sc., Agrostologist

THE Western District of Victoria is the largest and the most important pasture area of the State. This district is mainly located on a vast basaltic plain, which extends from Melbourne almost to the South Australian border. Over most of this plain the soil is rather shallow and of only medium fertility, but scattered throughout are a number of extinct volcanic cones to the north-east of which is usually found a considerable area of rich "volcanic" soil.

The northern portion of the district is mainly devoted to fine wool production with cereal cropping—wheat and oats—in certain areas. In the southern and western areas, where the rainfall is rather higher, dairying and cattle fattening are more important, but many pastures are grazed by sheep either for wool or fat lamb production. With the recent improvement of the native pastures some of the recognized wool-producing areas are now being used extensively for the production of fat lambs.

During recent years much interest has been taken in the improvement of pastures in the Western District, and throughout the area there are striking examples to be seen of the improvement that has been effected. The main method of improvement is top-dressing with superphosphate accompanied by the introduction of subterranean clover, while on most of the better land perennial rye grass is also

Weighing the grass clippings from a mowing manurial trial, Cobden.

useful. Early pasture improvement work had shown that the Western District was not uniformly responsive to treatment, and, though most of the land did respond well, there were considerable areas on which the usual methods were not altogether satisfactory.

In order to obtain more definite information as to the best methods of pasture improvement in Victoria, experimental pasture work was commenced in 1932 by the Department of Agriculture for the Victorian Pasture Improvement League. Trial plots were established on many different types of pasture to determine the most suitable pasture species and the most effective manurial treatments. The purpose of this report is to give a summary of the general results so far obtained and to indicate methods by which pastures in the various parts of the Western District should be improved. (The actual detailed results of the plots are to be found in the annual reports published each year in this *Journal*.)

Before proceeding to a discussion of the results, it will be advisable to consider the reasons for the Western District pastures being as they are, and the influences now limiting their growth.

The successful growth of pasture depends mainly on climate, soil fertility, and the presence of suitable pasture species. All three of these factors have to be favorable if good pasture growth is to be made. A pasture cannot be improved by the mere introduction of desirable species unless both soil and climate are favorable for their growth. Since the climate cannot be altered, pasture improvement is restricted to the improvement of soil fertility and the introduction of more productive species. For this reason it is in the districts of rather low soil fertility and where the better pasture species have not been introduced that the most spectacular results from pasture improvement can be expected. In the Western District the climate is generally favorable for pasture growth, although in the northern portion the rainfall is rather low and erratic. In the south, much of the soil is naturally rich, and it is here that productive introduced pasture species have become widely spread.

Irrespective of the species present or the condition of soil fertility, pasture growth in the Western District is restricted by the weather to certain seasons of the year. Pasture growth is mainly confined to the spring, but in favorable seasons good autumn and some winter growth can be expected. During the summer months green feed is scarce, except on the flats and late-maturing country, and stock are mainly dependent on surplus dry growth from the previous spring to carry them through the summer period. There is seldom any shortage of feed in the spring and summer periods, but autumn and winter growth is variable and uncertain, depending on the autumn and winter rains. The main object of pasture improvement in this district, therefore, is to increase the amount of feed available during this lean period. For this purpose subterranean clover and top-dressing with superphosphate are most effective. Pasture improvement helps the winter feed position, firstly by increasing the rate of growth of pasture during periods when growth is slow, and, secondly, by enabling more fodder to be conserved from the abundant spring growth which it encourages.

Except that the rainfall in the Western District decreases rapidly from south to north, the climate over the area is fairly constant.

and variations in pasture growth are mainly due to fertility or soil moisture supply.

The soils and pastures of the district vary so greatly that it is not possible to give specific directions that would be applicable to the improvement of all. Each pasture must be considered with regard to the soil that it is growing on and its present state of development, but there are general lines upon which all pasture improvement must be directed. The combination, "subterranean clover and superphosphate," in most cases has effected a marked increase in pasture growth, and in the Western District must be regarded as the basis of all pasture improvement. The degree of response to superphosphate varies considerably according to the class of soil.

Fodder conservation in the spring provides feed for lean periods.

On the *rich volcanic country* and on the *fertile stony rises* there is no acute deficiency of plant food and artificial fertilizers do not show very marked results. The volunteer pasture species on the rich soils are mainly annuals such as barley grass, spear grass, soft brome, hair grass, burr medic, and annual weeds. Perennial rye grass usually does not hold very well on this land. It either becomes tufty and pulls out with grazing in the summer or excludes the clovers and itself becomes unproductive. Although this land is well supplied with plant food, and fertilizers generally do not show much response, superphosphate does sometimes give an increased growth and improve the palatability of the feed. The winter growth on the volcanic country is usually good, but pastures growing on this type of soil suffer from dry periods and usually mature early in the spring. For sowing on the rich land *Phalaris tuberosa* is well suited, and cocksfoot, prairie grass, and perennial rye grass are also useful. In comparison with its growth on most other soils in the Western District, the growth of perennial rye on this rich volcanic country is disappointing. This rich land is largely used for cultivated crops, for which purpose it is better suited than for pasture.

The deep, strong sandy loams are normally capable of carrying good perennial pastures, but their growth can be greatly stimulated by the use of superphosphate. Both subterranean clover and perennial rye grow well on this class of soil, and cocksfoot and Phalaris are useful in pasture mixtures. On this type of land Yorkshire fog tends to become prominent in pastures in the wetter districts, while in the drier areas Cape weed and the annual grasses are more troublesome.

In the southern Western District there is a large area of rather light land—some a fine sand and some a shallow buckshot silt loam—naturally not carrying a satisfactory pasture for dairying, but which, on top-dressing with superphosphate and the introduction of subterranean clover with some perennial rye grass, is capable of improvement into good dairying country. On such land, soil fertility is all important, and, if a good pasture is to be developed and maintained, it will be necessary to apply superphosphate annually and to refrain from cutting grass hay more often than is necessary. On the rather light sandy soils Cape weed and annual grasses may become troublesome, and pastures growing on such soils are liable to be severely attacked in the winter by the cockchafer grubs.

In the better rainfall areas on the shallow buckshot soils, perennial rye grass, white clover, and subterranean clover can flourish so long as soil fertility is maintained, but, if soil fertility be allowed to decline, then Yorkshire fog, sweet vernal, flat weed, and bent grass dominate the sward.

Small mowing manurial trial plots, Western District.

The "plains" country in the northern portion of the Western District is rather low in fertility, and the rainfall is considerably lower than in the south. The native pastures in this area consist mainly of wallaby grass and other persistent perennial grasses well adapted to the rather severe conditions. On this type of land increasing the soil phosphate content by means of top-dressing with superphosphate will encourage subterranean clover to become established, and, providing it builds up the soil fertility sufficiently, perennial rye grass later may be encouraged to make good growth.

The Western District contains considerable areas of low-lying heavy black flats which, after draining, have developed good pastures of perennial rye grass, white and strawberry clovers. Despite the natural richness of these soils, the pastures respond well to top-dressing with superphosphate, and provide valuable green grazing in the summer. On some of the drier black soils, where perennial rye grass has become dominant to the exclusion of the clovers, it is usually found that the response to superphosphate is poor.

In a few parts of the Western District are found soils consisting mainly of gritty sands which grow bracken or grass tree and stunted scrub. These soils can be somewhat improved by manurial treatment, but their development is usually slow and the result often disappointing compared with that obtained on the better land.

Manurial Trials.

Superphosphate has proved to be the most effective fertilizer for the stimulation of pasture growth in the Western District. Dressings of this fertilizer are most effective when applied early in favorable autumns, and an annual dressing of from 1 cwt. to one bag per acre is probably the most economic quantity to apply. The greatest response is seen in the winter and early spring, and, under Victorian climatic conditions, superphosphate mainly stimulates the winter-

A contrast between swards. Left, superphosphate only; Right, superphosphate plus potash. The hammer is lying on the division line separating the two plots.

growing annual clovers, trefoils, and grasses. Not only does top-dressing of responsive land increase the bulk of feed, but it increases the quality and in many cases enables healthy stock to be reared on pastures that previously were regarded as unsound.

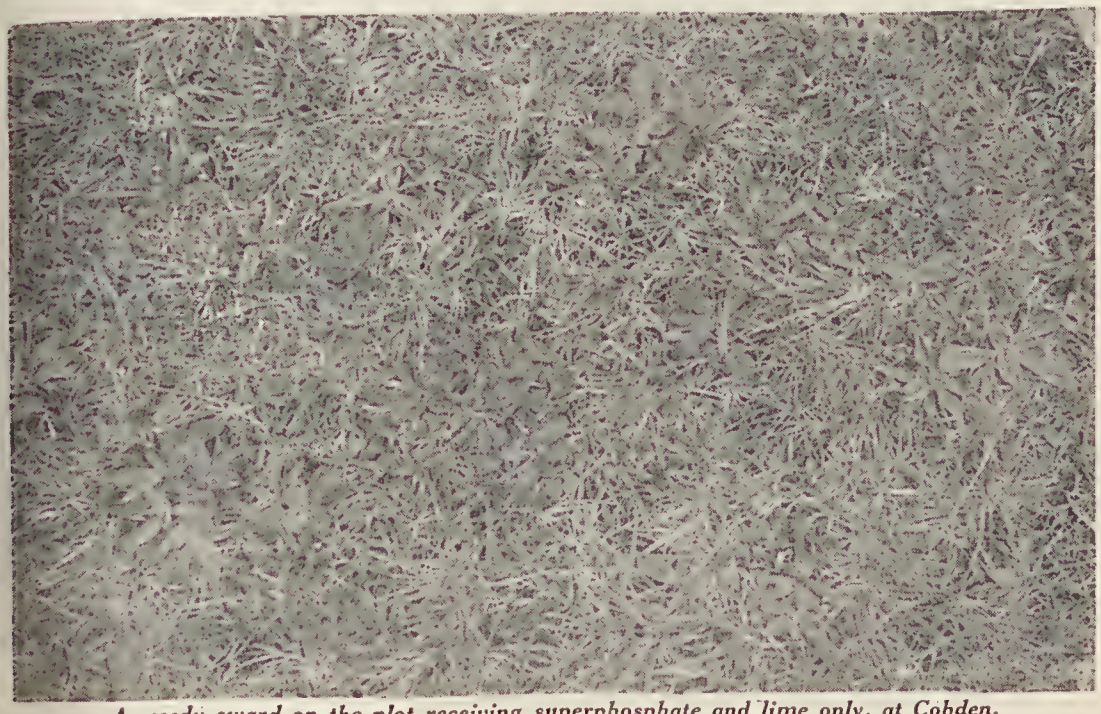
Potash.—Although most of the soils are initially well supplied with potash, the supply may quickly become exhausted unless the pasture is properly managed. Repeated cropping of the land or the too-frequent cutting for grass hay may quickly deplete the soil's reserve of potash. Light soils which have been stimulated to make strong growth by the use of superphosphate are the first to show the ill-effects of bad management. Heavy soils will maintain their production for a longer period when mismanaged, but even they will eventually reach a stage when the growth on them will be unsatisfactory unless potash be applied. Potash is naturally returned to the soil through the animal droppings, and every effort should be made to see that they are returned to and distributed over the pasture.

Lime has been included in all the Western District pasture trials, but it is only in very few cases that there has been any indication of a response in growth. In some other parts of the State lime has been found to be of benefit, but the Western District generally does not show any response to its application.

Nitrogenous Fertilizers.—Applications of sulphate of ammonia have been made to various pastures at all seasons of the year, and it has been found that, providing soil moisture conditions are favorable, nitrogenous fertilizers can be expected to increase the growth of grass during the winter and early spring. However, this fertilizer is expensive, and the stimulus to growth is of short duration only, and the subsequent ill-effect on the pasture severe and long sustained. Pastures do better when obtaining their necessary nitrogen by means of the clover growing with them rather than through the use of artificial fertilizers.

Results of Species Trials.

Subterranean clover and perennial rye grass have proved to be the two most valuable species for pasture improvement in the Western District. On the deep volcanic soils or on the heavy clays *Phalaris tuberosa* is also useful, while on the late pastures white clover and cocksfoot are valuable, and strawberry clover is well suited to the heavy black wet flats. Other species, such as Yorkshire fog, sweet



A weedy sward on the plot receiving superphosphate and lime only, at Cobden.

The addition of potash to the sward illustrated in the previous photograph has greatly improved growth. Note the increased density of clover.

vernal, burr medic, and the introduced annual grasses are frequently found making a valuable contribution to the bulk of feed on volunteer pastures, but these species are rarely used when sowing down pasture. Cluster, suckling, and knotted clovers have become widespread throughout the whole Western District.

The excellence of the perennial rye grass found growing on suitable soils in the Western District has been recognized for many years, but it was evident that its growth was restricted to certain favoured areas. Subterranean clover, on the other hand, is capable of becoming established on poor soils, and, if top-dressed with superphosphate, will grow vigorously and improve soil fertility. Although subterranean clover is an excellent plant for sheep pastures, it has serious shortcomings where used for dairying, and for this purpose should be grown in a mixed pasture together with a perennial grass. Being an annual, it matures early in the summer and leaves a mass of dry feed, which, although suitable for sheep, does not provide satisfactory grazing for dairy cows. Furthermore, it requires good soaking rains in the autumn for it to make any material growth before the winter. It is not a very good competitor against Cape weed and the volunteer annual grasses, and the fact that the ground is left bare over the summer facilitates the entry of such annual weeds.

Subterranean clover is at its best when grown in association with perennial grasses such as perennial rye grass, cocksfoot, or Phalaris—these grasses making autumn growth before the subterranean clover becomes established, thereby providing early feed and suppressing the annual weeds.

The proportion of the clover present in a mixed pasture can be controlled by the grazing treatment given. Hard close grazing favours subterranean clover, while lenient grazing, and particularly allowing the pasture to reach the hay stage in the spring, favours the grass. Good early autumn rains favour the clover, and a poor autumn may result in a mixed pasture becoming almost entirely grassy.

On shallow soils in the drier areas, where perennial rye grass does not flourish, it is often found that after a few years of vigorous clover growth the subterranean clover pastures tend to become weedy. The plants most commonly found on these deteriorated pastures are barley grass, soft brome, hair grass, spear grass, Cape weed and Storksbill (*Erodium*).

Such weeds usually are of a shallow-rooted winter-growing type, and have come in as a result of the subterranean clover having built up the fertility of the surface layer of soil. Since such plants do not thrive where the surface soil is of lower fertility, the most effective treatment consists of ploughing and burying this surface layer of excessive fertility. Ploughing and cropping destroys this layer and checks the annual grasses, while the subterranean clover can become re-established readily under the lower fertility condition.

Yorkshire fog grass is very common on improved pastures in the Western District. Early in the season its young growth makes a useful contribution to the feed from the pasture, but later the mature growth provides very poor grazing. Where growing in competition with perennial rye grass, close grazing will check the Yorkshire fog and encourage the rye grass. Nothing encourages Yorkshire fog so much as light grazing or closing the paddock in the spring and leaving the old dry feed stand over the summer. The Yorkshire fog grass is most prominent on low-lying damp pastures, but after a few wet years may become prominent on drier land. Wet seasons favour Yorkshire fog, and during the recent period of dry seasons it has become much less prominent.

Other pasture plants of considerable local importance in portions of the Western District are Kentucky blue grass in the Portland-Port Fairy districts, meadow foxtail on the leniently-grazed wet flats of the southern Western District, Wimmera rye grass in the drier northern portions and on the rich soils in the dry stony-rise areas, and lucerne on well-drained alluvial soils and on the deep, rich soils near the volcanic cones.

Over most of the Western District summer-growing species such as paspalum, Kikuyu, and couch grass (*Cynodon*) are not commonly found in grazing paddocks; and, while flat weed (*Hypochoeris radicata*) is very common on most pastures, rib grass (*Plantago lanceolata*) is common in a few areas only.

The Western District pastures are generally very responsive to pasture improvement methods, but care must be exercised in their management if this improvement is to be maintained and deterioration, due to the weeds or depleted soil potash reserves, is to be avoided.

A strong growth of Cape weed outside the fence of the Colac West mowing trial plots. The Cape weed is encouraged by the discarded grass clippings and the trampling of stock.

Australian Brown Onion Seed for Britain

HOW VICTORIAN GARDENERS CAN HELP

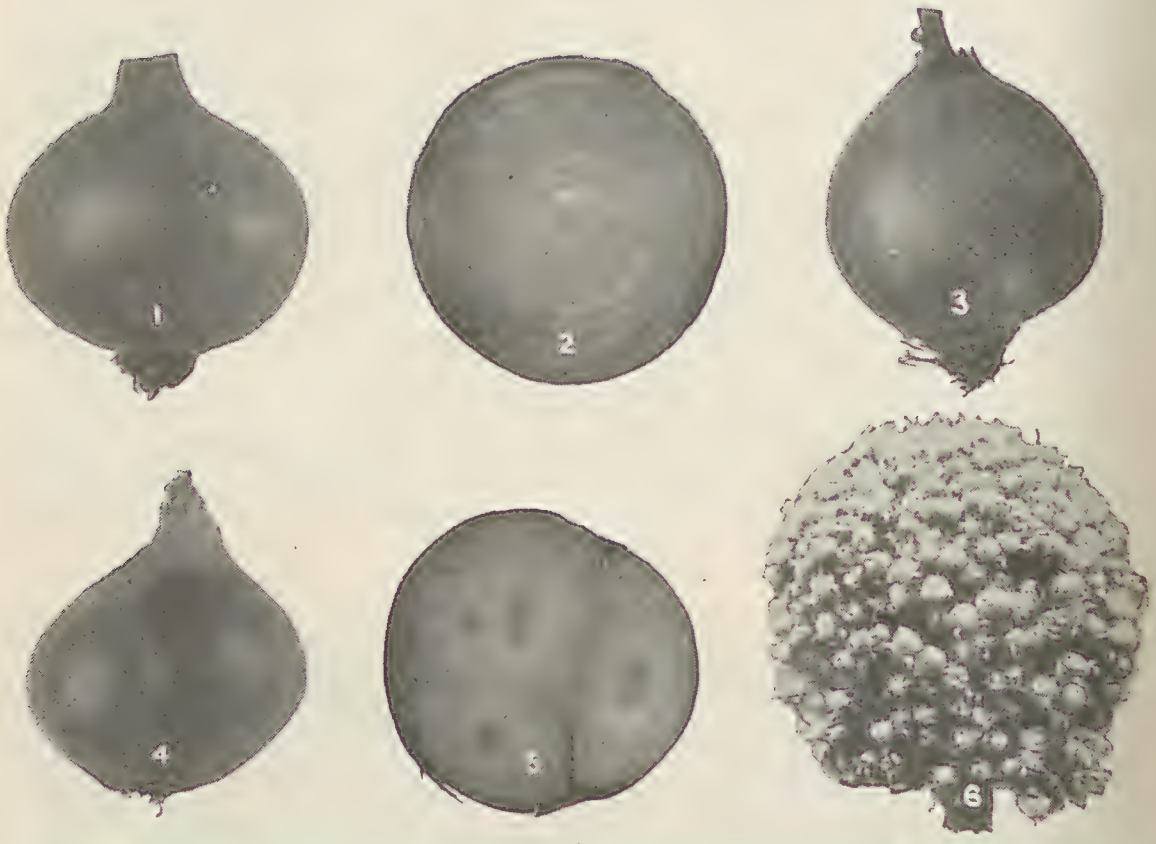


Fig. 1.—(1) Sound type Victorian Brown Onion; (2) Cross section of No. 1 showing regular concentric rings; (3) Off-type (neck too thin); (4) Off-type (irregular and segmented); (5) Cross section of No. 4; (6) Onion seed-head approaching ripeness.

ONE serious effect of the war has been to cut off from Great Britain the supply of several important farm and vegetable seeds, including onion seed. If onion bulbs were planted now in private gardens in Victoria or in other situations where they can be watered if necessary, a considerable quantity of onion seed could be produced to meet at least a portion of Britain's urgent requirements.

The seed will be distributed to home gardeners in Britain for use in their own household allotments. Such a gift of seed from home gardeners in this country would be a most appropriate gesture. Inquiries were made early in 1941 by the Department, and the following cable has been received from England:—

"Minister of Agriculture expresses grateful appreciation generous offer to grow onions and other vegetable seeds in Victoria as gift to England which will be of great assistance in overcoming one of our most serious difficulties of seed supplies."

It has been decided to concentrate our efforts on Australian brown onion seed for the present. This variety has no superior for general purposes, and as a long keeper it has no equal.

Selection of Bulbs.

Onion *seed* is produced by planting *bulbs* of the previous crop, but only bulbs of good quality should be used to maintain the quality of the variety.

Each bulb should be quite sound in all respects and have a complete skin of good brown onion colour, quite free from cracks, which would disclose the immature skin below.

In shape the bulbs should approximate to that shown in Figure 1 (Nos. 1 and 2). The shoulder should be well filled and of tapered outline. It should not be flat or dished. The stem should be central and bulbs should be discarded for irregularity of shape and particularly for segmentation of the type shown in Figure 1 (Nos. 3, 4, and 5).

On no account should more than one variety be grown for seed in the one allotment. If two varieties flowering at the same time are grown, hybrid seeds will develop and the onions produced from this seed will be of poor quality

Planting and Cultivation.

The quantity of bulbs to plant an area of 1 acre is approximately one and a half tons. For a bed of 200 square feet approximately 17 lb. of onions would be required. The soil requires to be in good tilth, but does not need to be rich in animal manures. The best manurial treatment is to dig into the soil superphosphate (obtainable from all seedsmen) at the rate of 2 oz. per square yard of the space being used.

In small plots, hand-hoed, the bulbs may be planted during June and July in rows about 2 feet apart and about 18 inches apart in the rows. In horse-cultivated areas the distance between the rows is greater, say, 2 ft. 6 in. to 3 feet, and the bulbs correspondingly closer in the row. The bulbs should be placed root downward so that the tops are not more than half an inch to an inch below the surface of the soil, and watered immediately after planting unless the soil is particularly moist. Keep weeds down and water whenever necessary.

The treatment subsequent to the leaves appearing above ground consists merely in keeping weed growth down by shallow hoeing and watering if conditions are dry and warm. In hoeing tend to move the soil up to the bulb rather than away from it. When the plant has put up a number of seed heads watering is best carried out by means of a furrow between the rows and *not* by *overhead spraying* as, in the later stages of maturity, water severely damages the maturing seed head.

Often a good deal of seed is lost by the seed shoots bending and breaking off, but this may be overcome by staking and tying each individual head or by running two or three strings along on either side of the seed rows to hold the heads in position.

Fig. 2.—Onion seed-heads being cured before threshing.

Harvesting and Curing.

Nearing maturity the seed stalks take on a yellow appearance, and the seed pods become white and papery and tend to burst, showing the seed (Fig. 1, No. 6). Harvesting should be carried out at this stage, otherwise the seed will fall. Seed heads are mature usually in early February and threshing takes place at the end of February or in early March.

In harvesting the heads leave a few inches of stalk adhering to each and immediately place them on canvas, calico, or bag sheets.

Curing is accomplished by leaving the seed heads in the sun for several days. At night or when the weather is wet the heads are rolled up in the sheets and placed under cover. After the curing process is completed the heads are left under cover in a well ventilated position and the seed threshed out by light flailing or trampling. For large plots, curing is most conveniently carried out by placing the heads loosely in chaff bags tied at the neck and about half full. These bags are best slung over a rail to cure in the open (Fig. 2) unless rain falls, when they should be placed under cover. Preliminary threshing is performed by trampling before the bags are opened.

The Horticultural Division of the Department of Agriculture, Melbourne, C.2, will supply further details on inquiry and receive all seed after threshing for final cleaning prior to its despatch to England.

Marking out check banks on graded land to be irrigated by the border method. In this instance the grader is being used as a crowder.

Irrigated Pastures in the Maffra District

By G. B. RAYNER, B.Agr.Sc., Assistant Agrostologist

THE State Research Farm at Werribee is the cradle of irrigated pasture investigation in Victoria, and was for many years the only Victorian centre at which work of this nature was carried out. During recent years pasture plots have been established in the Goulburn Valley and the northern irrigation areas, and most recently in the Maffra district. Reports on the work at Werribee and elsewhere have been published from time to time, and Maffra farmers who read these reports, or heard recommendations based thereon, naturally desired to know to what extent the results obtained at Werribee would apply to the Maffra district. Two years ago that question could not be fully answered; but, in the autumn of 1939, experimental plots were established on the property of Mr. R. Rautman, Tinamba; and the results from these plots indicate the directions (if any) in which the findings of other centres will have to be modified to suit local conditions.

It is proposed, therefore, to give a brief outline of the guiding principles of irrigated pasture culture as determined experimentally at Werribee, and then to see to what extent the Tinamba plots have shown them to apply to the Maffra district.

Five factors must be considered in the establishment and maintenance in high production of an irrigated pasture, namely—(1) preparation of the land, (2) selection of the seed to be sown, (3) manurial treatment, (4) watering treatment, and (5) grazing management.

(1) Preparation of the Land.

Preparation of the land involves the formation of a firm clean seed bed and the actual grading of the area for irrigation. The former may be obtained by normal fallowing methods and the cultivation operations carried out to get the land into condition for grading. When grading it is essential to lay the area out in

such a way as to permit the irrigator to control the flow and distribution of the water on the land. For this to be possible, each section of the land on which the water is released must slope in one direction only, so that the water will flow in that direction in an even sheet. Theoretically, a paddock of any size could be graded in this way; but in practice it is divided into bays, bordered by check banks. These bays follow the direction of greatest slope, and are level from side to side. This constitutes the successful "border" system of lay-out. Before grading, a contour survey should be made to locate the slopes to allow the grading to be carried out in the most economical way, and with a minimum disturbance to the surface soil.

After newly-graded land has been watered for a season it will require further attention. Hollows filled in during the first grading may have reappeared, and imperfections not apparent at first will be revealed. It is a wise plan, therefore, with land graded for the first time, to sow it down with a temporary crop. Then, after one or two seasons of watering, the faults in the grading can be remedied and the permanent crop sown.

(2) Selection of the Seed to be Sown.

The following mixture of grasses and clovers, known as the "Standard Mixture," is recommended by the Department of Agriculture for growing under irrigation:—Certified perennial rye grass, 10 lb. per acre; Victorian or certified New Zealand cocksfoot, 5 lb. per acre; Italian rye grass, 5 lb. per acre; prairie grass, 2 lb. per acre; certified New Zealand wild white clover or Victorian irrigation wild white clover, 1 lb. per acre; New Zealand perennial red clover, 2 lb. per acre; subterranean clover, 1 lb. per acre; alsike clover, 1 lb. per acre; strawberry clover, ¼ lb. per acre.

It is most important when buying seed for sowing to make sure that it is good seed, free from weeds, and of high germination. The perennials should be true to name. This may be ensured by the purchase of Government certified seed when available. The seed should be sown with superphosphate, so that the seedlings will have a readily available supply of plant food to enable them to make a good early development and better fit them to stand up to weed competition.

(3) Manurial Treatment.

Various amounts and combinations of manures have been tried out during the past fifteen years, and superphosphate by itself has proved to be the manure most suitable for irrigated pastures. In certain areas increases in yield have been obtained from the use of other manures in addition to superphosphate, but these increases have not been as great as those obtained from the use of additional superphosphate. At Werribee, where the watering system is adequate (the land is watered fortnightly during the summer months), it has been found that superphosphate can be applied profitably at the rate of 4 cwt. per acre per annum. The more frequently the pasture is watered, the more superphosphate can be put on with profit. Another test at Werribee has shown that no advantage is obtained by splitting the annual quota of superphosphate into two or more dressings. The usual time to apply the superphosphate is in the autumn.

Besides increasing the yield of the pasture, the liberal application of superphosphate has been shown to bring about a dense, well-balanced sward, a good development of the perennial clovers (white and strawberry) to the exclusion of the annual clover (subterranean), the best conditions for the development of perennial rye grass, and a suppression of weeds.

(4) Watering Treatment.

Frequent waterings during the summer months were found to be necessary to keep an irrigated pasture in full production. In parts of Werribee, where a penetration of only 2 inches of water can be obtained at each irrigation, the interval between waterings should not exceed a fortnight, if the best results are to be obtained. This applies in the Goulburn Valley also, where the soil, like that at Werribee, is relatively impermeable. The increase in the efficiency of the water, effected by the application of superphosphate, is most marked when the irrigations are frequent.

(5) Grazing Management.

The principle of rotational grazing, under which the stock are concentrated in one paddock for a short time and then moved on to another, is now generally accepted. Not only does it lead to a higher production from the pasture, but it favours the development of the more valuable species at the expense of weeds and inferior types, avoids waste and the development of rank patches, and, by encouraging the formation of a denser sward, makes for the more economical use of the irrigation water. The fodder value of the pasture has been shown to vary according to the period of rest allowed

between grazings, and there are indications that the length of this rest period may have an effect on the botanical composition of the pasture. As the result of a test at Werribee, it has been recommended that each paddock should be rested for a period of three weeks to one month between successive grazings.

A luxuriant growth of irrigation white clover.

The Maffra Plots.

The plots at Tinamba are designed to test only three of the above factors, namely, seed mixture, watering, and manuring. However, the same general principles of grading and grazing management should apply to the Maffra as to any other irrigation district. It is essential that proper care be taken with the grading, irrespective of what part of the State the land is situated. The plots were laid out on the approved "border" system, but the precept of sowing a temporary crop on land graded for the first time was not followed. This has caused trouble. A hollow which was filled in when grading subsequently subsided, and during the wet summer of 1940–41 this area became flooded and rendered that section of the plots useless. This hollow was filled in and resown in the autumn of 1941.

The plots are situated about 2 miles east of Tinamba and 3 miles west of Maffra, on the main road between these two towns. The soil, which is typical of the district, is a dark-grey sandy loam. It had not been sown to pasture previously. Some years ago the area was used for maize growing; in 1937 it grew sugar beet, in 1938 oaten hay, and in April of 1939 the plots were sown.

The test consists of two duplicate sections which are mowed and grazed in alternate years. Each section comprises four bays. Of these, two are watered at three-weekly intervals and two at six-weekly intervals. Each bay is divided into nineteen plots. The first twelve are manurial plots and the next seven pasture mixture plots. The manurial plots were sown with the Standard Mixture and given the following manurial treatments annually:—

1. No manure.
2. Superphosphate 1 cwt. per acre.
3. Superphosphate 2 cwt. per acre.
4. Superphosphate 3 cwt. per acre.
5. Superphosphate 4 cwt. per acre.
6. Superphosphate 6 cwt. per acre.
7. Superphosphate 2 cwt. + lime 10 cwt. per acre.
8. Superphosphate 2 cwt. + gypsum 10 cwt. per acre.
9. Superphosphate 2 cwt. + potassium sulphate 1 cwt. per acre.
10. Superphosphate 2 cwt. + ammonium sulphate 1 cwt. per acre.
11. Superphosphate 2 cwt. + ammonium sulphate 1 cwt. + potassium sulphate 1 cwt. per acre.
12. Superphosphate 2 cwt. + ammonium sulphate 1 cwt. + lime 10 cwt. per acre.

The pasture mixture plots were sown with the following mixtures of seed and given 2 cwt. of superphosphate per acre annually:—

A. Standard Mixture.

B. Perennial rye grass 10 lb. + N.Z. white clover 2 lb. per acre.

C. Perennial rye grass 5 lb. + cocksfoot 4 lb. + N.Z. white clover 2 lb. per acre.

D. Perennial rye grass 5 lb. + *paspalum dilatatum* 4 lb. + N.Z. white clover 2 lb. per acre.

E. Perennial rye grass 5 lb. + lucerne 3 lb. + subterranean clover 2 lb. per acre.

F. *Phalaris tuberosa* 4 lb. + lucerne 3 lb. + subterranean clover 2 lb. per acre.

G. Perennial rye grass 5 lb. + cocksfoot 4 lb. + perennial red clover 2 lb. per acre.

Each manurial treatment and each species mixture appears once in each bay. The plots are scattered at random, and there is a different scatter for each bay.

There was a good uniform germination. In the early stages the development of the seedlings on the "no manure" plots was not as good as on the top-dressed plots. The plots which received lime and gypsum appeared to be the best. On the pasture mixture section there was a good germination of all species except *paspalum dilatatum*, but none of this latter seed germinated Red clover rapidly became the most conspicuous species, and it is still the dominant clover on the plots where it was sown.

The plots were cut for the first time in August, 1939. Pathways, 2 feet wide between the manurial plots and 6 feet wide between the species plots, were cut with the motor lawn mower. Then each plot was mowed separately, the green clippings were weighed, and a sample was taken for moisture determination. The plots have been cut in this manner at approximately monthly intervals ever since.

A typical white clover pasture.

The results for the first year are shown in the following tables:—

MANURIAL PLOTS ON THE PROPERTY OF R. RAUTMAN, TINAMBA, 1939-40.

Treatment (cwt. per acre per annum).	Lb. Dry Matter per Plot (mean of duplicate plots). A.	B.
1. No Manure	35·0	33·0
2. Superphosphate 1	40·7	40·4
3. Superphosphate 2	48·9	41·2
4. Superphosphate 3	43·6	39·5
5. Superphosphate 4	45·6	41·5
6. Superphosphate 6	51·3	48·9
7. Superphosphate 2 + Lime 10	45·1	37·5
8. Superphosphate 2 + Gypsum 10	41·7	38·7
9. Superphosphate 2 + Sulphate of Potash 1 cwt.	46·3	39·0
10. Superphosphate 2 + Sulphate of Ammonia 1 cwt.	40·9	39·0
11. Superphosphate 2 + Ammonia Sulphate 1 + Pots. Sulphate 1	45·3	42·7
12. Superphosphate 2 + Ammonia Sulphate 1 + Lime 10	44·9	38·0

MANURIAL PLOTS ON THE PROPERTY OF R. RAUTMAN, TINAMBA, 1939-40.

Mixture (lb. seed per acre)	Lb. Dry Matter per Plot (mean of duplicate plots). A.	B.
A. Standard Mixture	48·1	41·8
B. Per. Rye grass 10 + N.Z. White Clover 2	44·3	41·9
C. Per. Rye 5 + Cocksfoot 4 + N.Z. White 2	45·2	41·3
D. Per. Rye 5 + Paspalum 4 + N.Z. White 2	49·3	38·1
E. Per. Rye 5 + Lucerne 3 + Sub. 2	34·9	32·8
F. Phalaris 4 + Lucerne 3 + Sub. 2	37·4	32·9
G. Per. Rye 5 + Cocksfoot 4 + Per. Red 2	42·6	37·6

Note: A. = watered 3-weekly. B. = watered 6-weekly.

It will be seen that the top-dressed plots are better than the "no manure" plot in each watering treatment. No manure or combination of manures applied in addition to 2 cwt. of superphosphate is better than 2 cwt. of superphosphate by itself. (It is true that the superphosphate + ammonium sulphate + potassium sulphate plot in the watered six-weekly bays shows an increase over the superphosphate 2 cwt., but the difference is too small to be significant.) It is, therefore, apparent that for the Maffra district—as elsewhere—applying superphosphate alone is the best manuring practice. With regard to the amount to apply, 2 cwt. appears to be the limit of profitable application in the bays watered at three-weekly intervals. Under the six-weekly watering schedule, there is little difference

between 1, 2, 3, and 4 cwt., with a marked increase in the 6-cwt. plot. This last plot, however, yields only the same as the superphosphate 2 cwt. watered three-weekly. The results from the first year of mowing indicate that the best combination of watering and manuring treatments is watered three-weekly—superphosphate 2 cwt. per acre.

The following year the other section of the plots has been mown, but the results are not yet complete. There has been little difference between the two watering treatments during the summer owing to the high rainfall. Once again 2 cwt. of superphosphate per acre appears to be the limit of profitable application, but there are indications that responses may be obtained from potassium sulphate and lime plus ammonium sulphate in addition to 2 cwt. of superphosphate.

Two watering schedules only were tried out, and the three-weekly proved to be the better, particularly on the well-manured plots. It is considered that, whereas a fortnightly schedule is necessary at Werribee, three-weekly waterings should be sufficient for the more permeable soil of the Maffra district.

The results from the pasture mixture plots indicate that the sowing of a complete mixture would not have been justified on this area. It must be remembered that as no *paspalum dilatatum* germinated, Treatment D is actually perennial rye grass 5 lb. plus New Zealand white clover 2 lb. per acre. Under each watering treatment, all the simple mixtures, except those containing lucerne and subterranean clover, proved to be as good as the more comprehensive Standard Mixture. Red clover, alsike clover, subterranean clover, and Italian rye grass are included in the Standard Mixture to give a good growth during the first couple of years, while perennial rye grass, cocksfoot, and white clover, which are slower in becoming established, are developing. Therefore, if the Standard Mixture were to show to advantage, it would be during the first season or two. It is not anticipated in future years that the white clover, which has become well established on the plots sown with a simple mixture, will be outstripped in production by the white clover at present suppressed by the red clover on the Standard Mixture plots.

It has been shown conclusively that wild white clover is a definitely superior strain to the white Dutch for an irrigated pasture. This point is emphasized because it is apparent that the relative merits of these two strains are not fully appreciated in the Maffra district.

Summary.

Experience elsewhere and the results from the test plots at Tinamba indicate that the factors which will govern the successful growth of irrigated pastures in the Maffra district are: Careful attention to grading and preparation of the seed bed; selection of good seed—a simple mixture of certified perennial rye grass, cocksfoot, and wild white clover is recommended; the application of superphosphate at the rate of 2 cwt. per acre per annum; a three-weekly watering schedule; and, finally, controlled grazing, giving each paddock a recuperation period of from three weeks to one month between successive grazings.

Mowing, weighing, and sampling the produce from experimental grass plots.

Budding, Grafting, and Methods of Re-working Fruit Trees

By

J. L. PROVAN, B.Agr.Sc., Senior Horticultural Instructor, and F. J. GREATOREX, Orchard Supervisor

The purpose of this article is to explain in detail the principles of budding and grafting, and the methods by which these practices may be used for re-working, i.e., changing the variety, of fruit trees. An endeavour has been made to assist the grower and more experienced grafter and to instruct the beginner.

THE processes of budding and grafting are used for propagating, re-working, providing pollinating branches in fruit trees, repairing injuries and, by inarching, to re-invigorate trees. Grafting, as a means of repairing trees damaged by implements, rabbits, hares and diseases, is not practised as extensively as it should be in Victorian horticulture.

Growers sometimes have seedlings from which they desire fruit as early as possible. By grafting scions of these on to established trees, fruit can be obtained in the second season. Budding and grafting also offer a rapid method for the propagation of such seedlings.

In England, grafting has come to the assistance of the horticulturist in his fight against bacterial canker in plum trees, (1). In Victoria, and other parts of the world, the budding of citrus varieties on to gummosis (collar rot) resistant root-stocks has reduced the incidence of that disease. The control of woolly aphis on the roots of the majority of our apple trees is possible only because varieties can be budded or grafted on to resistant root-stocks. The same processes enable invigorating or dwarfing root-stocks to be used for our fruit trees. Varieties frequently are so influenced by root-stocks that their climatic tolerance, and the season of maturity, as well as the size and quality of their fruit are affected. In budding and grafting, each part, whether stock or any one of a number of scions worked on a stock,

retains its own individuality and therefore is always recoverable. The influences just mentioned exist only while the particular combination is maintained.

A consideration of this wide range of uses of budding and grafting emphasizes the vital part they play in horticulture, *but their main use to the commercial fruitgrower is in the elimination of unprofitable varieties.* Many Victorian orchardists are confronted with this problem, and they have to decide on one of two alternatives—either grubbing out the trees and re-planting, or re-working them by budding or grafting to more profitable varieties. The former alternative need be adopted only in the case of weak or diseased trees. It is obviously unsatisfactory to incur the expense of re-working trees which have a doubtful future, or are affected by a wood-rotting fungus, such as *Polystictus.* On the other hand if the trees are vigorous and healthy, they should be re-worked.

A recent census revealed that there were approximately two and one third million apple trees in Victoria, and at least 170 varieties of apples. Eleven of these varieties constituted 90 per cent. of the trees and the remaining 10 per cent. (230,000 trees) comprised 159 varieties. All of the first-mentioned varieties are profitable, but only a few of the latter are worthy of continued cultivation. The remainder could well be eliminated from Victorian horticulture. Making allowance for those trees which, for various reasons, it would be undesirable to graft, there are approximately 100,000 of these apple trees which should be re-worked. To this total may be added the number of all other kinds of fruit trees in this State which should be re-worked to bring Victorian fruit varieties to a really modern level.

Fig. 1.—A young apple tree top-worked with bark grafts. Partially defoliated.

Prior to 1932, only "top-working" methods (erroneously called "crown-grafting" in Victoria) were practised by orchardists in this State for re-working fruit trees, and the strap, bark and cleft grafts were those most favoured for deciduous trees. About 1932 the method of "frame-working" by grafting in laterals and by peg-grafting was introduced, and in 1936 the Victorian Department of Agriculture, in a "re-working" campaign for pome fruits, popularized frame-working by the use of the inverted "T", "L" and "Needle" grafts, and also the whip-tongue and cleft grafts on strong laterals. The success which attended this work justifies the recommendations given hereunder.

Explanation of Terms.

Propagators and re-workers use a number of terms which may be unfamiliar to some growers and the following brief notes are given in explanation.

Stock—is a tree, or part of a tree, in which a bud or graft is inserted.

Scion—is that part of a variety which is to be "worked" on to the stock. The term scion is used also to denote *all* that part of the tree above the union with a stock.

Grafting Scion—is a dormant piece of the last season's growth, with more than one growth bud, which is to be used as a scion. Occasionally, older wood is used.

Bud—is a term used to denote a scion with only one growth bud which may have a small piece of wood attached. It is usually taken during the period of active growth of the tree. When, however, budding is done in the spring, the bud is taken from dormant wood and is termed a spring bud. The term "Shield-bud" refers to the shape of the piece of bark cut off with the bud.

Bud Stick (or Bud-wood)—is a mature shoot of the current season's growth removed from the tree to serve as a convenient form of handling and supplying buds. In spring budding, the previous season's growth is used.

To Work—to bud or graft on to a young tree as in nursery practice.

To Re-work—to bud or graft on to an established tree, usually an already worked tree, with the object of changing the variety.

Callus—is that part of plant tissue formed by the active growth of the living cells around a wound.

Fig. 2.—A frame-worked apple tree, on the property of Moore Bros., Blackburn.

The following summary and classification of the kind of methods for working and re-working, and some of the synonyms employed, will be useful to the beginner. The terms recommended for use in this State are shown in bold type; the synonyms are shown in brackets :—

Top-Working (Crown-grafting).

Strap.
Cleft (Wedge).
Oblique Cleft (Oblique Wedge).
Whip-tongue (Whip and Tongue; Tongue).
Bark (Rind).
Bud (Shield Bud).

Frame-Working—

(Pole-grafting, Porcupine Grafting, Modified Side Grafting).

Peg (Plug, Chisel).

Bark Grafts—
"L",† "V" and "⊥" (Inverted "T").
Needle (Awl, Straight Split).
Gouge.

Stub Grafts—
Bark (Rind).
Cleft—Mid-split (Wedge).
Side-cleft (Side graft).
Whip-tongue.
Bud in lateral.

† Some grafters refer to this graft as an inverted "L" (⅂) but from the operator's view-point the cut made in the bark is L-shaped.

The following grafts and buds are not commonly used in Victoria, and it is not proposed to deal with them in this article:—saddle, side-tongue, slotted-side, splice or whip, and the veneer rind grafts, and the chip, flute, patch, forkert and ring buds.

Principles of Budding and Grafting.

Beginners are apt to contemplate budding and grafting with awe, and to imagine that expert skill, beyond their capacity, is necessary for success. Actually, with ordinary care, and the possession of an easily acquired knowledge of certain plant characteristics, which are dealt with in detail below, successful results are within the easy attainment of all.

Budding and grafting operations are rendered possible because a small part of the tree can survive for a time, after being cut off, provided drying out does not occur. If the part is removed during the growing period, survival is usually of short duration. Hence bud-sticks taken at this season must be carefully protected from drying, and used as soon as possible after their removal from the tree. Dormant wood will survive much longer. Grafting-scions, kept cold and moist, can easily be held in a viable condition for four or five months.

On examining a smooth cross-section of a fruit-tree branch, aged three years or more, in active growth, it will be found to consist of a woody centre with annual growth rings, the

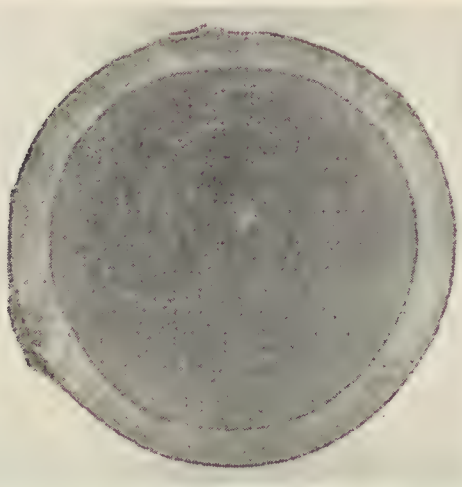


Fig. 3.—Transverse section of a 5 year-old apple branch showing the bark, wood and cambial region. The latter is shown in the picture as a circle between the bark and the wood.

outside bark, and a very moist narrow ring—the cambial region—between the wood and the bark. Wood, bark and cambium are present in every shoot and are essential to budding and grafting.

The cambium is actually a very thin layer of brick-shaped cells which are capable of growing and increasing in number. They form woody cells on the inside surface and bark cells on the outside. In this way the branch or shoot increases in thickness. When in active growth, the cells contain a large amount of sap, and the cell walls, as well as those of the few surrounding layers, are weak and easily broken. This is the reason why the bark can be separated readily from the wood during growth periods, and why budding and grafting operations can be performed so easily at those times. Growers use the term "when the sap is rising" to denote this stage of growth. If a piece of bark is lifted from a branch at this time, the cambium, or growing region, adheres to the bark. The exposed, young, woody cells of the branch, which appear so moist and slippery, retain some of their power of growth and produce callus, which, in the case of a graft, unites with callus formed by the scion, and, in the case of a bud, with the cambial cells on the inside surface, provided that a close contact is made in each instance*. The extreme importance of this close contact cannot be over-stressed, because much of the success in budding and grafting depends on it. If the exposure of these growing surfaces is unduly prolonged, or if any foreign matter, even water, is allowed to get between them, they will not unite. Under favorable conditions they do unite, or "take," and subsequently, growth of the scion occurs and the stock and scion become firmly connected by woody tissue. All budding and grafting operations are only means of bringing the fresh growth-producing tissues (cambial regions) of the scion or bud into close contact with similar tissues of the stock, so that a firm union will result. All of the many methods of budding and grafting have been developed to suit particular stages in the conditions of the stock or scion, or the fancy of the grafter.

* For a good review of the literature dealing with the formation of graft and bud unions, and compatability (which will be referred to later), the student is referred to the Imperial Bureau of Fruit Production, Technical Communication, No. 9, by G. K. Argles.

Use of Growth Hormones in Grafting.

In recent years, Söding (2) and Evenari and Konis (3) have employed growth substances with a certain amount of success in vine-grafting, and the latter investigators by the use of these substances have shortened the time required for a good union and increased the callus formation.

Affinities between Scion and Stock—Deciduous.

All fruit trees can be budded or grafted; but these operations will be successful only if a near botanical relationship and a close affinity exist between the constitution of the scion and that of the stock. If the union and the subsequent performance are satisfactory the varieties used as scion and stock are said to be *compatible,* and if unsatisfactory, they are termed *incompatible.* It is not always possible to predict whether varieties will be compatible. In many cases an actual trial is necessary to decide this point. There is such a large number of varieties of each kind of fruit, that the affinities of all the possible combinations, in all probability, never will be fully investigated. However, many combinations of varieties and kinds of fruit have been made, and as a result of these trials much knowledge on compatibility has been accumulated (see footnote).

The grower who is faced with a re-working programme will require to know whether the scion varieties he intends to use will be compatible with his existing varieties (stocks).

Generally speaking, a variety of one kind of fruit tree is compatible with another variety of the same kind of fruit tree, e.g., scions of *Jonathan* (or any other variety of apple) can be successfully worked on to *Rymer* (or any other variety of apple). Similarly, one variety of peach is compatible with another variety of peach, and so on.

It is possible also, in many instances, to bud or graft a variety of one kind of fruit on to a variety of a *different* kind of fruit, e.g., some varieties of pear can be worked on to any variety of the common quince; most almond varieties on to any variety of peach; and most apricots on to any variety of European plum. Most varieties of pears are dwarfed when worked on to quince stock, but a few varieties succeed fairly well. (See accompanying table.)

The following table of affinities will serve as a guide to the grower who desires to work or to re-work any of his trees. Where kinds of fruit are omitted as scions, they can be generally regarded as being incompatible with the particular stock. In some instances, partial success has been obtained with some combinations, and in others the results have been variable. In this table, both of these results have been classified as unsatisfactory.

Table of Affinities.

Existing Tree (Stock).	Scion.	Remarks.
Apple (*Pyrus Malus*)	Apple (all varieties)	Compatible
	Quince (all varieties)	Not used—probably unsatisfactory
	Pear	Unsatisfactory
Pear (*Pyrus communis*)	Apple (all varieties)	Unsatisfactory
	Pear (all varieties)	Satisfactory
	Quince (all varieties)	Not used, probably unsatisfactory
Quince (*Cydonia vulgaris*)	Apple (all varieties)	Not used, probably unsatisfactory
	Pear	Variable. Satisfactory varieties on this stock are Glou Morceau, B. Hardy, Doyenné du Comice, and Conference. Other pear varieties are decidedly dwarfed by quince
	Quince (all varieties)	Satisfactory
	Loquat (all varieties)	Satisfactory, slightly dwarfed
	Medlar (all varieties)	,, ,, ,,
Peach and Nectarine (*Prunus Persica*)	Peach (all varieties)	Satisfactory
	Nectarine (all varieties)	,,
	Almond (all varieties)	,,
	Apricot (all varieties)	,,
	European Plum	King Billy, Angelina Burdett, and Clyman are satisfactory varieties. Grand Duke, Diamond, and President are sometimes satisfactory. Other varieties are untested
	Japanese Plum (all varieties)	Satisfactory
Plum—European (*Prunus domestica*)	Peach (all varieties)	Unsatisfactory
	Nectarine (all varieties)	,,
	Almond (all varieties)	,,
	Apricot (all varieties)	Satisfactory
	European Plum (all varieties)	,,
	Japanese Plum (all varieties)	,,
	Cherry (sweet) (all varieties)	Unsatisfactory
Plum—Japanese (*Prunus salicina*)	Peach (all varieties)	Unsatisfactory
	Nectarine (all varieties)	,,
	Almond (all varieties)	,,
	Apricot (all varieties)	,,
	European Plum (all varieties)	,,
	Japanese Plum (all varieties)	Satisfactory—results in other countries show that some varieties are unsatisfactory

Table of Affinities—continued.

Existing TREE (Stock).	Scion.	Remarks.
Cherry (Sweet) (*Prunus Avium*)	Cherry (sweet) (all varieties)	Satisfactory
	Cherry (sour) (all varieties)	,,
	Other kinds of fruit	Untested
Cherry (Sour) (*Prunus cerasus*)	Cherry (Sweet) (all varieties)	Satisfactory, dwarfing stock
	Cherry (Sour) (all varieties)	Satisfactory
Apricot (*Prunus Armeniaca*)	Peach (all varieties)	Unsatisfactory
	Nectarine (all varieties)	,,
	Almond (all varieties)	,,
	Apricot (all varieties)	Satisfactory
	European Plum (all varieties)	Unsatifactory
	Japanese Plum (all varieties)	,,
Almond (*Prunus Amygdalus*)	Peach (all varieties)	Unsatisfactory
	Nectarine (all varieties)	,,
	Almond (all varieties)	Satisfactory
	Apricot (all varieties)	Unsatisfactory
	European Plum (all varieties)	Unsatisfactory, results variable
	Japanese Plum (all varieties)	Unsatisfactory
Walnut		
(*Juglans regia* (English))	Walnut (*J. regia*) (all varieties)	Satisfactory
(*J. Californica* var. *Hindsii*)	,, ,, ,, ,,	,,
(*J. Californica*)	,, ,, ,, ,,	,,
(Paradox (hybrid))	,, ,, ,, ,,	,,
(Royal (hybrid))	,, ,, ,, ,,	,,

Affinities in Citrus.

Most varieties of sweet orange, sour orange (Sevilles), mandarin, lemon, and grapefruit can be worked in any combination with good results. Trifoliate orange (*Poncirus trifoliata*) has proved to be a dwarfing stock. Valencia Late orange and some mandarin varieties are more satisfactory than other varieties of citrus on this stock. The growth of about 10 per cent. of Washington navel orange trees budded on *P. trifoliata* appears to be much better than the growth of the remaining 90 per cent. of the trees, suggesting that this stock is rather variable.

With the exception of the Maltese variety of blood orange, citrus varieties are compatible with the rough lemon or citronelle (*C. limonia*) stock.

In Victoria, very successful results have followed the re-working of Beauty of Glen Retreat, Early Imperial and Scarlet mandarin trees, growing on rough lemon root-stock, to Valencia Late oranges. Many "off-type", so-called Australian and dry strains of Thompson's Improved navel orange trees have all been successfully re-worked to Washington navel and Valencia Late oranges and Marsh grapefruit.

Tools.

Only a few tools are necessary for the budding and grafting operations, but it should be remembered that good tools in first class

Fig. 4.—Left, a grafting knife; Right, two types of knives used for budding.

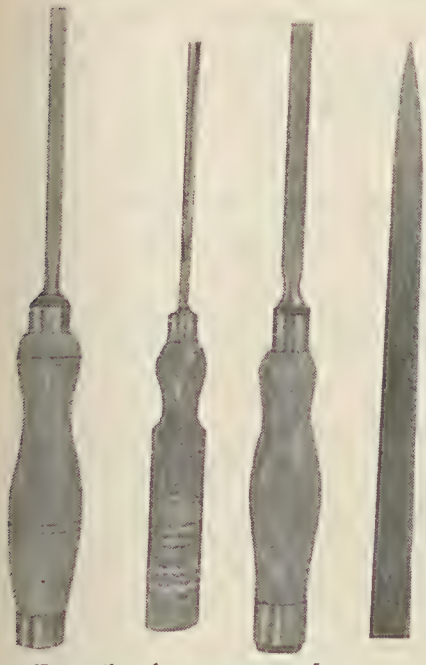


Fig. 5.—A gouge and two chisels used for gouge and peg grafting respectively. Right, side view of chisel blade showing special bevels.

condition will result in quicker and better workmanship. The tools commonly used are secateurs, budding and grafting knives, chisels, mallet, "needle," hammer and splitter (for making the cleft in the stock).

Suitable types of budding and grafting knives are shown in Fig. 4. The grafting knife should have a strong, straight or slightly curved, blade about $2\frac{1}{2}$ in. long. This blade should be sharpened on an oil stone, until it has a keen, flat-ground surface. The budding knife blade is usually $1\frac{3}{4}$ inches to 2 inches long and not more than $\frac{1}{2}$ inch wide, and should be sharpened in the same manner as the grafting knife. The back of the blade, or the end of the handle, of a budding knife is made so that it can be used for lifting the bark from the stock.

In Fig. 5 are shown $\frac{1}{4}$-in. and $\frac{3}{8}$-in. chisels for use in peg grafting. These chisels are specially ground to $\frac{3}{4}$-in. level on front and back, making them wedge-shaped. Also in Fig. 5 is shown a $\frac{1}{4}$-in. gouge used for the gouge graft. New gouges will require sharpening before use.

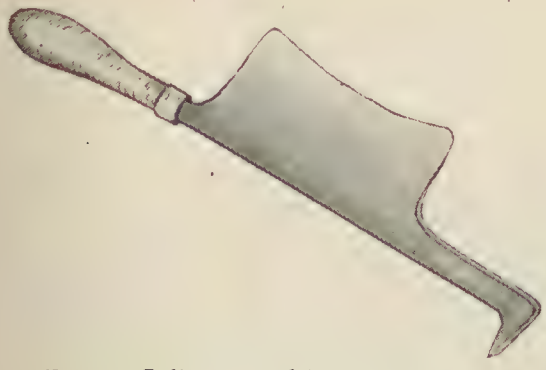


Fig. 7.—Splittter used for cleft grafting.

Fig. 6.—Shortened packing needle inserted into an awl handle.

The "needle" (see Fig. 6) is a converted $5\frac{1}{2}$-in. packing needle. It is made by cutting off about a $\frac{1}{4}$ inch of the point, sharpening the squared end, and then removing about 2 inches of the eye-end of the needle. The shortened needle is then inserted into a handle.

A splitter is a tool, made of iron or steel, with a 6-in. blade, and a narrow continuation in the form of a wedge. (See Fig. 7.)

References.

1. East Malling Annual Report for 1939, p. 83.
2. Söding. H. Hort, Abs. IX No. 1, Mar., 1939.
3. Evenari M. and Konis E. Hort, Abs. IX No. 1, March, 1939.

The foregoing is the first instalment of an article dealing with the subjects of Budding, Grafting and Methods of Re-working Fruit Trees. Further instalments will appear in subsequent issues of this Journal.

Fat Lambs in Victoria

By

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FAT lamb production in Victoria has extended tremendously over the last ten years. Although Victorian consumption of lamb has increased in recent years to approximately 1,500,000 carcasses per annum, the average number exported from Victorian ports, principally to the United Kingdom, in the last five years has been nearly 3,000,000, i.e., almost twice the Victorian consumption. In the ten years 1919–20 to 1928–29 the average annual export from Victoria was only a little over 1,000,000 lambs, exports having been trebled since those years.

The above exports include a large but indefinite number of lambs from New South Wales which were slaughtered in Victoria, and also lesser numbers from South Australia and Tasmania. During recent years, producers have received an average of approximately £1 per lamb (including the skin), the total value to farmers of lambs slaughtered in Victoria being approximately £4,500,000 per annum.

The increased production has coincided with a wave of pasture improvement by means of top-dressing with superphosphate and the introduction of improved pasture species, and also with the greater use of British breeds of sheep in the breeding programme. By the use of these breeds, instead of the fine wool types, lambs of superior type and grade are produced with greater certainty.

Because of the increasing importance of the fat lamb industry, the Government Statist, Mr. O. Gawler, agreed to collect statistics from which a better picture of its distribution could be obtained. The total matings of ewes had been collected formerly, and these showed an

increase from 4,490,000 ewes mated to lamb in 1926 to 7,073,000 in 1936, and 9,607,000 this year. The increase was partly in matings mainly for fine wool production (with Merino, Corriedale and Polwarth rams), but was largely due to the greater production of crossbreds.

In 1940 the statistical returns showed separately the number of ewes mated with the above-mentioned breeds of rams, and those with British breeds of rams. They include pure-bred ewes, but these are well distributed throughout the State, and are negligible when compared with the flock ewes.

These figures have been mapped on the basis of returns from each parish in Victoria, and give a good indication of the distribution of ewe matings according to the main purpose for which the lambs are intended :—

(*a*) For fat lambs, crossbred mutton, or half-bred ewes (5,294,900 ewes) ; and

(*b*) Fine wool production (4,604,857 ewes).

The distribution of the lambs themselves at the time they are marketed will vary with the season and with the movement of the ewes from district to district both before and after lambing, e.g., many lambs are fattened on irrigated or late pastures although they are not all bred there.

The lambing percentage obtained also varies considerably in different districts. Available statistics indicate a range over a period of years for all breeds from 68 per cent. (1938 drought) to 83.5 per cent. In the four years 1936–39 the recorded percentages in the various districts were as follow :—

PERCENTAGE OF LAMBS MARKED TO EWES MATED.

District.	1936.	1937.	1938.	1939.	Average Four Years 1936–39.
	%	%	%	%	%
Mallee ..	74	82	56	78	71
Wimmera ..	57	72	61	79	67
Northern ..	78	82	58	87	76
North Eastern ..	81	84	78	84	82
Western ..	79	85	80	74	79
North Central ..	82	91	71	88	83
Central ..	86	96	85	78	86
Gippsland ..	82	82	82	89	84
Victoria ..	76·5	83·5	68·1	81·5	77·4

The above table of statistics is for all breeds. Variations between districts are due both to environment and incidence of breeds. Prolificacy usually increases with the percentage of the blood of British-breed sheep in the ewe mother.

For lambing in 1941 the number of ewes mated in Victoria, mainly for fat lamb and mutton production, was a record, being 5,632,325—an increase of 337,425 over that of 1940. The number mated mainly for wool production was also greater than in the previous year, being 3,729,937—an increase of 125,080.

The distribution of rams of the different breeds in Victorian districts is shown in the following table, grouped according to the main purpose of the mating :—

(*a*) Fat lamb production.

(*b*) Fine wool production.

The figures in brackets indicate the change (increase or decrease) in percentage since 1940.

Although the Border Leicester ram is still the most popular, the 1941 statistics show a trend towards the greater use of Dorset Horn and Southdown rams. This change may be consolidated under the present marketing conditions which favour the early maturing breeds. Annual variations, however, may be misleading, and are partly due to the availability and price of rams of each breed in any particular season, and also to interstate trade. It is interesting to note that the statistics for 1936 of pure breeds of sheep in Victoria showed the following breed percentages :—

Border Leicester	44·5 per cent.
Southdown	14·5 ,,
Dorset Horn	12·9 ,,

The great majority of Riverina bred lambs exported from Victorian ports are progeny of the Border Leicester rams and fine wool ewes. Ewe lambs of this cross, or sired by Romney Marsh, English Leicester or Lincoln rams, are commonly retained to be mothers of fat lambs.

(*a*) Fat Lamb Production (5,632,325 Ewes Mated).

——	Mallee.	Wimmera.	Northern.	North-Eastern.	Western.	North Central.	Central.	Gippsland.	Victoria.
Number of rams	13,851	8,884	36,241	14,103	18,102	11,631	16,169	7,701	126,682
Ewes mated to these rams ..	742,850	413,566	1,637,213	631,136	755,085	498,012	639,699	314,764	5,632,325
Change in ewe numbers since 1940	−4%	−6%	—	+11%	+11%	+10%	+22%	+40%	+6%

Each Ram Breed as Percentage of District Total.

Breed of ram—	%	%	%	%	%	%	%	%	%
Border Leicester	58 (−8)	46 (−6)	43 (−4)	39 (−6)	31 (−3)	30 (−1)	20 (−6)	28	38 (−5)
Southdown	7 (+2)	11	27 (+1)	28 (+1)	24	31 (−2)	38 (+2)	19	25 (+1·5)
Dorset Horn	28 (+6)	30 (+4)	18 (+2)	7 (+1)	15 (+2)	17 (+1)	20 (+3)	19	18·5 (+2·5)
Romney Marsh	1	4 (+2)	1	7 (+2)	8	4 (+2)	6 (+1)	7	4 (+1)
English Leicester	1·5	3	2	4	4 (−1)	7 (−1)	5 (−1)	12 (+1)	4
Ryeland	1	1	4 (+1)	4	3 (+1)	3·5	3	2	3
Shropshire	1	1	2	6	3	3	2·5	1 (−1)	2·5
Lincoln	..	1	..	2 (+1)	9 (+1)	3 (+1)	1 (−1)	1	2
Suffolk	1·5	1	1·5	1	1	1	2 (+1)	..	1
Unnamed	1	2	1·5	2 (+1)	2	0·5	2·5 (+1)	11	2

(*b*) Wool Production (3,729,937 Ewes Mated).

——	Mallee.	Wimmera.	Northern.	North-Eastern.	Western.	North Central.	Central.	Gippsland.	Victoria.
Number of rams	4,059	20,732	8,589	6,302	49,681	7,972	6,452	4,388	108,175
Ewes mated to these rams ..	148,693	724,858	332,967	292,074	1,505,791	301,440	212,643	211,468	3,729,937
Change in ewe numbers since 1940	+7%	+1%	+4%	+5%	+5%	+2%	+4%	+1%	+4%

Each Ram breed as Percentage of District Total.

Breed of ram—	%	%	%	%	%	%	%	%	%
Merino	45 (+3)	81	49 (−5)	43 (−4)	59 (−1)	55 (−4)	24 (−7)	55 (−7)	58 (−2)
Corriedale	51 (−1)	16	47 (+5)	48 (+3)	24 (+2)	41 (+3)	58	40 (+5)	31 (+2)
Polwarth	4 (−2)	3	4	9 (+1)	17 (−1)	4 (+1)	18 (+7)	5 (+2)	11

Milking Cows on Pasture

Meat Meal as a Supplementary Source of Protein*

By A. C. T. HEWITT, M.Agr.Sc., Live Stock Science Officer

THE methods of grazing and supplementary feeding of milking cows at the State Research Farm, Werribee, where 75 to 90 pure-bred Red Poll and Friesian cows were milked daily during the period under review, are outlined in this article. It is shown that a good quality meat-meal supplies protein suitable to balance rations of home-grown fodders, such as cereal hay and grain, fed supplementary to pasture grass. The cows receiving meat-meal also produced larger quantities of richer milk.

The milking cows, which were divided into two herds, A and B, grazed rotationally night and day throughout the year on 70 acres of top-dressed, irrigated pasture, subdivided into nine paddocks. The rotational grazing-cycle was completed in 28 days. This area of 70 acres included 3 acres of headlands, and 2⅓ acres of irrigation channels and drains from which only limited grazing was obtained. The pastures were well established and the principal species present were perennial rye-grass (*Lolium perenne*), prairie grass (*Bromus unioloides*), cocksfoot (*Dactylis glomerata*), white clover (*Trifolium repens*), and strawberry clover (*Trifolium fragiferum*). Herd A, consisting

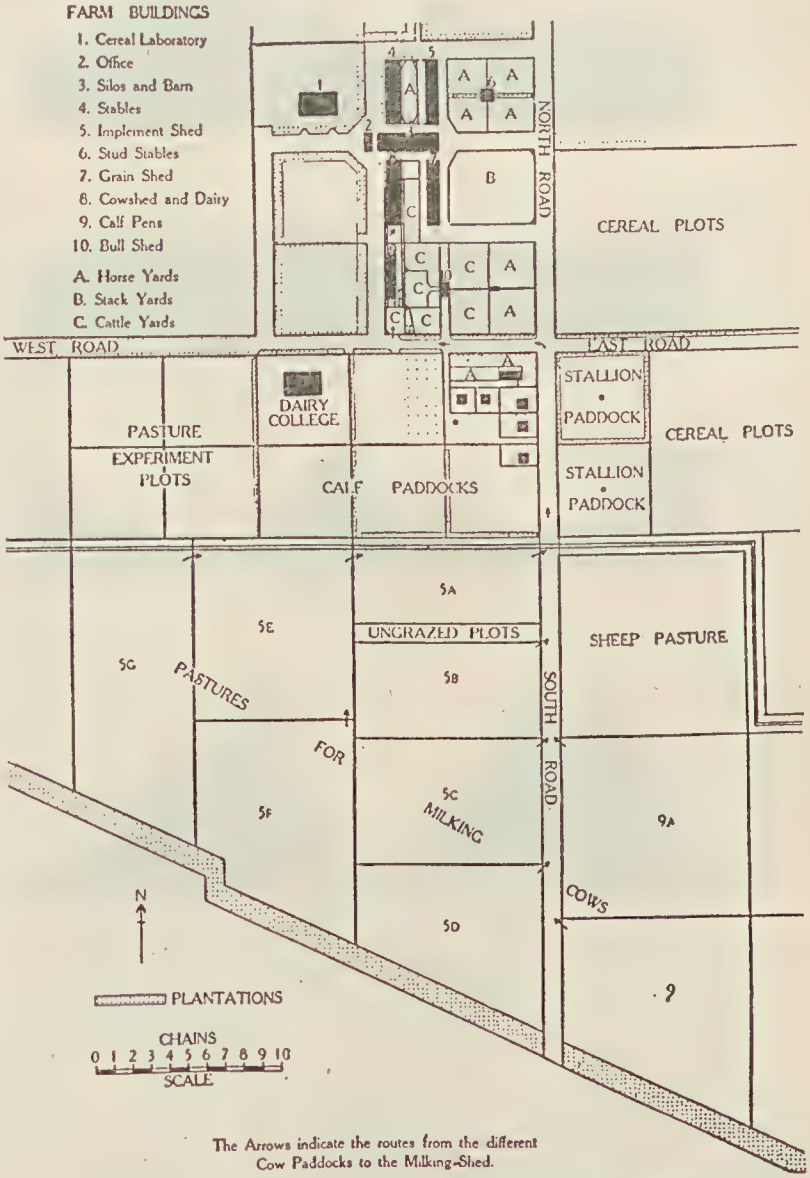

Fig. 1.—Plan of the pasture paddocks and farm buildings.
[*After* Emp. Jnl. Exp. Agr.

* This article was published originally in the Empire Journal of Experimental Agriculture, VIII, 26. Sections have been revised and later results added.

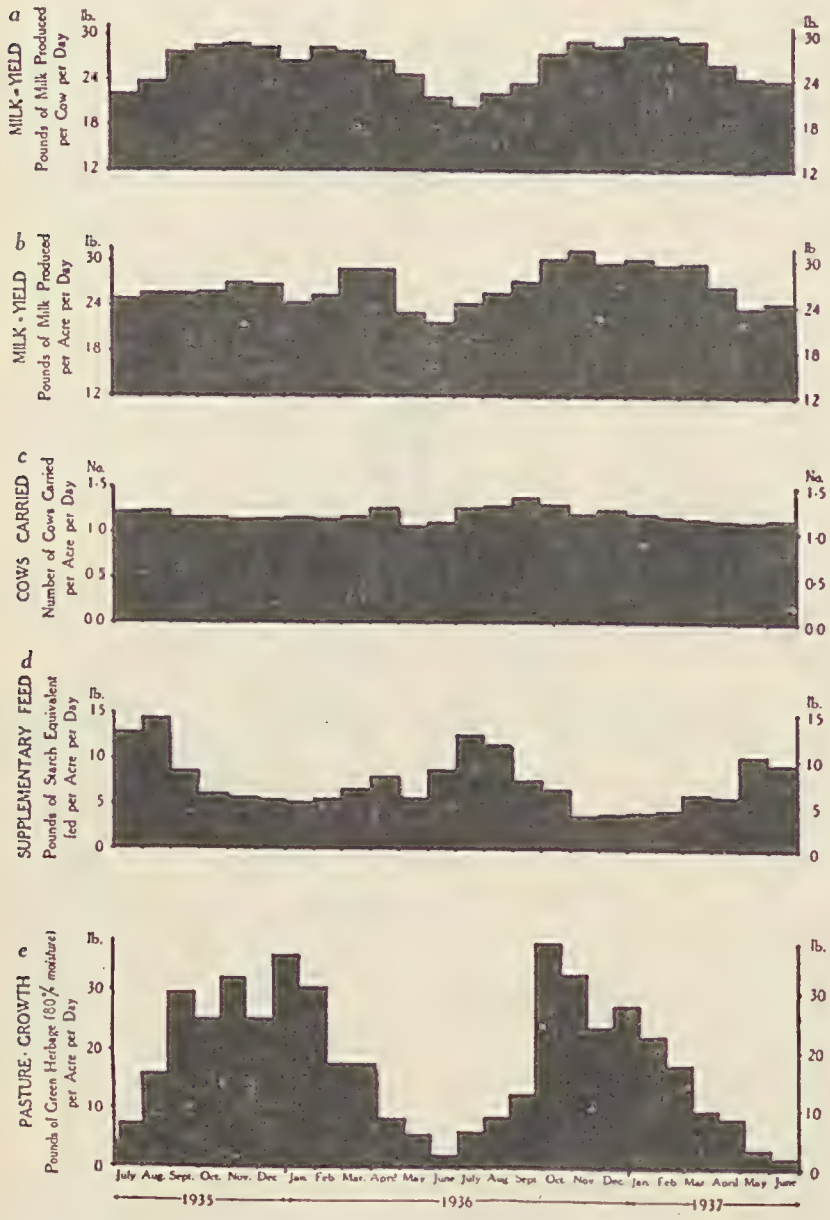

Fig. 2.—Histograms showing per day, from July, 1935, to June, 1937, (a) the milk-yield per cow, (b) the milk-yield per acre, (c) the number of cows carried per acre, (d) the amount of supplementary feed fed per acre, and (e) the amount of pasture-growth per acre.

[*After* Emp. Jnl. Exp. Agr.

of the fresher and heavier-milking cows, grazed the paddocks ahead of herd B, which acted as a follower. The number of cows in herd A was determined by the number of bails available in the milking-shed (usually 47 to 49). The remaining cows were run in herd B. The paddocks grazed by herd A were usually rested for two days before being grazed by herd B.

The milking shed was situated from 30 to 50 chains from the various pasture paddocks, and the cows were usually off the pastures for six hours each day. They were hand-milked at 5.15 a.m. and 3 p.m. daily, and fed supplementary rations in the milking-bails throughout the year. In late spring it was customary to close two paddocks and cut them for hay in December. The lay-out of the pasture paddocks and their location relative to the Farm buildings are shown in Fig. 1.

In Fig. 2, histograms covering the two-year period from July, 1935, to June, 1937, show the average daily figures of each month for the milk-yield per cow, the milk-yield per acre, the number of cows carried per acre, and the amount of supplementary feed fed per acre for the pasture paddocks shown in Fig. 1. The average amount of pasture-growth per day is also shown, but these figures cover intervals of 28 days and were obtained from the plots shown in Fig. 1 between paddocks 5A and 5B. The pasture on these plots was similar to the pasture on paddock 5B. A lawn-mower was used to cut the plots every 28 days and the clippings were collected, weighed, sampled, and tested for moisture - content. The weights were then standardized to contain 80 per cent. moisture.

The supplementary rations consisted principally of cereal hay (chaffed), grain (ground), and, for a short period in 1935, silage, all of which were produced on the farm. Each cow was fed the same quantity of roughage, which was varied seasonally, but the grain and concentrate portion of the ration was measured out to each cow in proportion

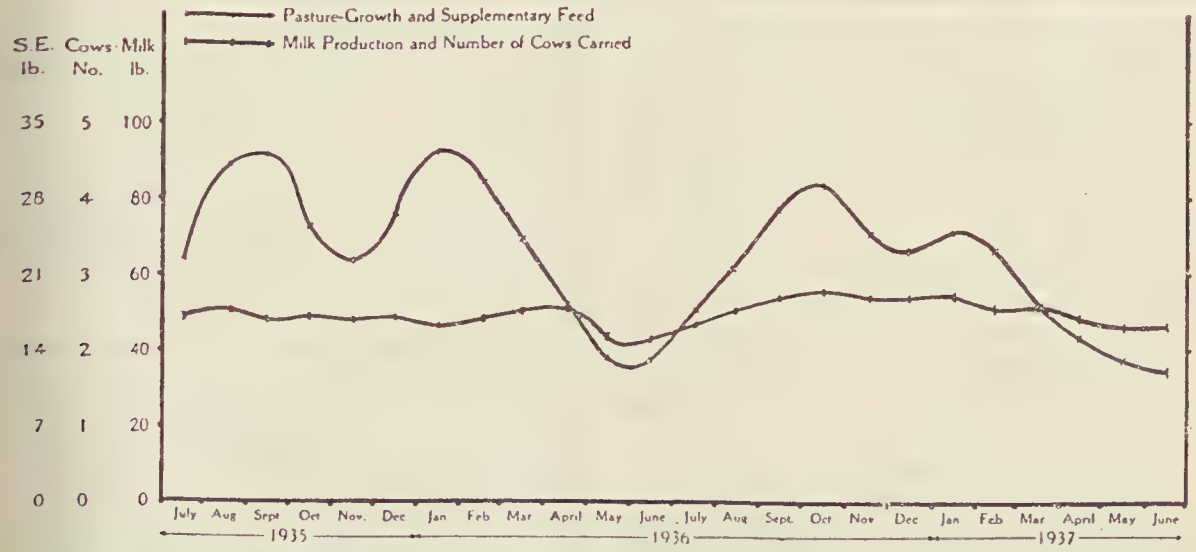
Pasture-Growth and Supplementary Feed
Milk Production and Number of Cows Carried
S.E. lb.
Cows No.
Milk lb.
35 5 100
28 4 80
21 3 60
14 2 40
7 1 20
0 0 0
July Aug Sept Oct Nov. Dec Jan Feb Mar April May June July Aug Sept. Oct Nov Dec Jan Feb Mar April May June
1935
1936
1937

Fig. 3.—Combined graphs showing from July, 1935, to June, 1937, (i) pasture-growth and supplementary feed as starch equivalent, and (ii) the number of cows carried and the weight of milk produced, per acre per day.

[*After* Emp. Jnl. Exp. Agr.

to her milk-yield. This was also increased and decreased with the season. Fig. 2D shows that the supplementary rations were increased during the winter periods when pasture-growth was slow.

During spring, summer, and early autumn, insufficient stock were carried to keep the pastures grazed down, and when winter approached there was an accumulation of pasturage which was grazed short during the winter (1). This pasturage, which accumulated before the winter, varied in length from 3 inches upwards, and in stage of maturity. The more mature herbage in the flowering stage contained many dead leaves in its lower parts. The surplus growth in the spring also was controlled to a large extent by concentrating the cows on fewer paddocks and cutting the pasture on the other paddocks for hay. In December, 1935, paddocks 5E, 5F, and 5G (then one paddock) were cut for hay, and paddocks 5C and 5G in December, 1936. In both cuts, the yield of hay was approximately 30 cwt. per acre. The subdivisions separating paddocks 5E, 5F, and 5G were made in September, 1936. Stock other than the milking cows were frequently grazed in the paddocks. In the calculations, five sheep have been reckoned as being equal to one cow, and two horses as equal to three cows.

In Fig. 3, two combined graphs are shown. One combines pasture-growth and supplementary feed with a deduction for the amount of grass cut for hay. The pasture-growth shown in Fig. 2E has been calculated in terms of pounds of starch equivalent per acre (2), and a correction has been made in the figures because paddock 5B, although covering only 7½ per cent. of the total grazing-area, produced 10 per cent. of the total milk yield and also carried 10 per cent. of the cows. Paddock 5B was a superior pasture paddock, as also was paddock 9.

The second combines the number of cows carried and the weight of milk produced per acre. Each of the graduations on the vertical axis represents 7 lb. of starch equivalent, one cow, or 20 lb. of milk. This graph shows how, by suitable supplementary feeding combined with pasture and herd management, steady production can be maintained throughout the year.

During 1936-37 the production-curve and the curve showing available food-material follow one another more closely, and this is attributed mainly to (i) the subdivision of the 26½-acre paddock into paddocks 5E, 5F, and 5G, and (ii) the addition of a good quality meat-meal to balance the supplementary rations.

A Valuable Source of Protein.

Experiments (3) have been conducted to show the value of meat-meal and of blood- and fish-meals as cheap sources of protein. In Australia, although knowledge of them is becoming general, it is not as yet widely applied.

The majority of meat-meals available in Australia are of the dry-rendered type, and different brands, sold as meat-meal, liver-meal, &c., contain various percentages of protein and

ash. Blood-meal, which is manufactured by a different process, is also available, but its value as a stock food is not appreciated, with the result that about 90 per cent. of the blood meal produced is sold as fertilizer.

In Victoria, the annual production of the boiling down works at present is about 10,000 tons of meat-, liver-, and blood-meals for live stock feeding and about 20,000 tons of blood, and blood and bone fertilizer. This production could be greatly increased by the treatment of more raw material. By slightly modifying the manufacturing process, most of the raw material now being used for making blood, and blood and bone fertilizer, could be converted into blood- and meat-meals for live stock food.

Various brands of meat-meal are being sold as stock food, but some are not suitable for feeding to milking cows. Usually such unsuitable brands have an offensive odour, and are unpalatable to the cows. A good quality, dry rendered and palatable meat-meal has not an offensive odour and, when mixed with other foods, it is readily consumed.

Following the development of the fish canning industry in Australia since the commencement of the present war, fish-meal has recently become available in small commercial quantities which are expected to increase with the growth of the industry.

In countries where hand-feeding of sheep and beef cattle is practised during the winter months, meat-meal is more widely used as a source of protein, and striking results from its use have been obtained, particularly by McCall and Hackedorn (4), and Peters (5). Marston (6), at "Meteor Downs," Central Queensland, showed that Merino sheep grew more rapidly and produced about 37 per cent. more wool when given free access to a supplement of blood-meal. Following this, the Australian Estates Company (7) has found blood-meal to be a superior source of protein for supplementary feeding of sheep during drought.

The significant results obtained from experimental feeding of meat-meal to pigs and poultry have long been recognized, and now they are being more widely applied.

A Feeding Experiment with Meat-Meal.

During June and July, 1935, a feeding-trial with meat-meal was conducted with the milking cows at Werribee. For several years previously the writer was of opinion that the relatively bare winter pastures did not supply sufficient protein to balance the large rations of cereal chaff, grain, and other concentrates fed to the milking cows as supplements to the sparse pasturage. In this experiment, the meat-meal not only increased the milk yields, but also the butter-fat content of the milk. As a result of this experiment meat-meal was regularly and successfully added to the supplementary rations of all milking cows on the farm.

No taints in the milk resulted, nor was the quality of the milk and cream impaired in any way by meat-meal feeding. Archibald (8) found that as much as 17 per cent. of meat-meal could be fed in the concentrate ration without causing any taint in the milk.

All the Friesian cows in herd A were used in the experiment. They were divided into two groups, cows being selected alternatively from a list containing their names in the order in which

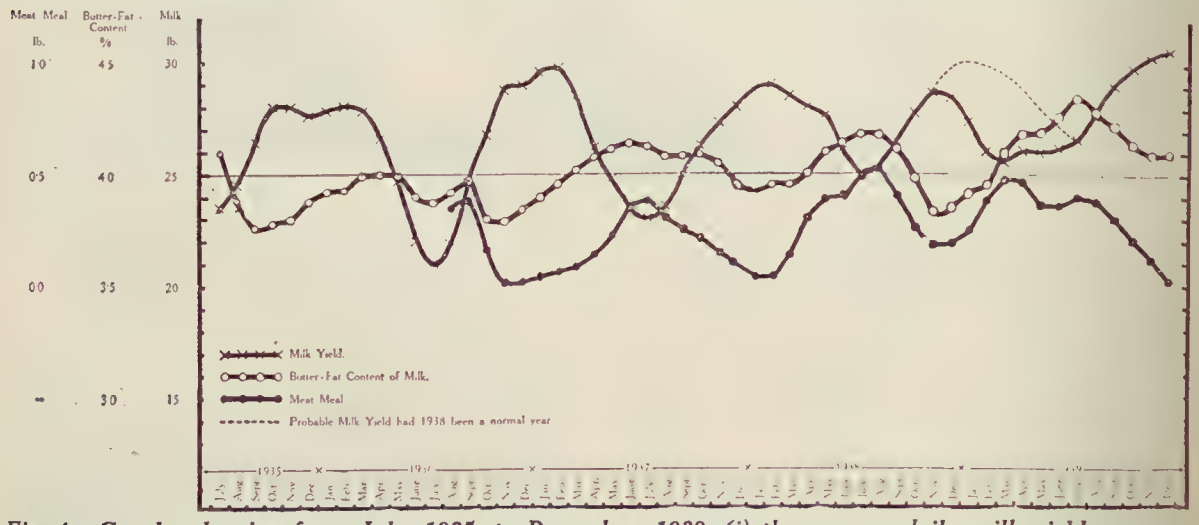

Fig. 4.—Graphs showing from July, 1935, to December, 1939, (i) the average daily milk-yield per cow, (ii) the average butterfat content of the milk, and (iii) from August, 1936, to December, 1939, the daily quantity of meat-meal fed per cow.

they had calved. The first group containing seven cows fed 1½ lb. of meat-meal daily, while the second group containing six cows was used as a control. The meat-meal was not intended as additional feed but, as the cows were being fed 1 lb. of concentrate for each 2¾ lb. of milk produced, it so happened that the average weight of concentrate, excluding meat-meal, fed to each cow in both groups was the same. The concentrate mixture contained bran, ground wheat, ground barley, ground oats, and ground peas in the proportions shown in Table 3.

Effect on milk-yield.—The milk from each cow was weighed and recorded at each milking. Butter-fat determinations were made on three composite samples from each cow, one being collected before feeding meat-meal, another during the feeding, and the third after the feeding of meat-meal was discontinued.

It has been the practice at Werribee to take the average daily milk-yield of cows over five consecutive day-periods rather than the average for each day, as this evens out minor variations resulting from changes to a fresh paddock, short changes in the weather, &c., and, when considering the combined herds A and B, changes due to introducing new cows and turning out dry ones. The average milk-yields shown are all for five consecutive day-periods.

The cows receiving meat-meal increased their milk-yields during the experiment, and, although they were producing 2·2 lb. more milk per cow daily prior to the experiment, they were giving 5·3 lb. more milk than the controls at the close of the experiment. The combined herds A and B showed very little variation in milk-yield during this period. Details of the changes in milk-yield of the cows in the meat-meal group, the control group, and the combined herds A and B are shown in Table 1.

TABLE 1.—*Effect of Feeding Meat-Meal on Milk-Yield.*

Date.	Average daily milk-yields in pounds.		
	Cows receiving meat-meal.	Control cows.	All cows (80) in herds A and B.
1935.			
June 10–14 ..	..	..	22·2
June 15–19 ..	..	..	21·9
June 20–24 ..	32·2	30·0	22·2
June 25–29 ..	31·7*	28·8	22·2
June 30–July 4 ..	31·2*	28·5	21·7
July 5–9 ..	34·0*	29·6	21·9
July 10–14 ..	34·8*	29·4	22·1
July 15–19 ..	34·1	28·8	22·2
July 20–24 ..	..	..	22·3
July 25–29 ..	..	..	22·8

* The meat-meal was fed from June 25 to July 14.

Effect on butter-fat content of milk.—The average butter-fat content of milk from the control cows and milk from the combined herds A and B are in agreement (Table 2), but the average butter-fat content of milk received from the cows that were given meat-meal rose 0·47 per cent. while the meal was being fed; it dropped back, however, to normal when the meal was discontinued.

TABLE 2.—*Effect of Feeding Meat-Meal on Butter-Fat Content of Milk.*

Time of collecting samples.	Average percentage of butter-fat in milk from—		
	Cows receiving meat-meal.	Control cows.	All cows (80) in herds A and B.
Prior to feeding meat-meal	3·66	3·36	4·28
While feeding meat-meal	4·13	3·24	4·15
After feeding of meat-meal was stopped	3·50	3·37	4·21

Rations fed.—The supplementary rations fed to, and the calculated food-requirements of, the Friesian cows during the meat-meal feeding experiment are shown in Tables 3 and 4.

TABLE 3.—*Supplementary Rations Fed during the Experiment.*

Foodstuff.	Supplementary rations per cow per day in pounds.					
	Cows receiving meat-meal.			Control cows.		
	Weight.	S.E. [2].	P.E. [2].	Weight.	S.E. [2].	P.E. [2].
Silage (oaten)	2·7	0·32	0·02	2·7	0·32	0·02
Chaff (oaten & wheaten)	14·3	5·22	0·56	14·3	5·22	0·56
Bran ...	0·6	0·26	0·05	0·6	0·26	0·05
Ground—						
„ Wheat	6·3	4·60	0·52	6·3	4·60	0·52
„ Barley	0·4	0·28	0·03	0·4	0·28	0·03
„ Oats	0·5	0·31	0·04	0·5	0·31	0·04
„ Peas	3·0	2·07	0·55	3·0	2·07	0·55
Meat-meal	1·5	1·26	0·82	..	..	..
Total ..	29·3	14·32	2·59	27·8	13·06	1·77
Nutritive ratio ..	1 : 5·5			1 : 7·4		

Results.—The average live-weight of the cows receiving meat-meal was 1,186 lb., whereas that of the control cows was 1,083 lb. The calculated food-requirements do not allow for changes in live-weight caused by growth, pregnancy, or improvement in condition. Exposure

to adverse weather and energy required for moving about and grazing are unknown factors that are not allowed for. The amount of grass grazed by the cows is unknown also.

TABLE 4.—*Food-Requirements of the Cows* [2].

Requirement for—	Cows receiving meat-meal.		Control cows.	
	S.E.	P.E.	S.E.	P.E.
	lb.	lb.	lb.	lb.
Maintenance ..	6·9	0·69	6·5	0·65
Milk	9·3	2·13	6·6	1·59
Total ..	16·2	2·82	13·1	2·24

The tables indicate that the control cows, receiving a supplementary ration with a nutritive ratio of 1:7·4, consumed as much energy in the form of starch equivalent as was calculated to cover their requirements, but there was a deficiency (0·47 lb.) of protein equivalent. To make up this deficiency the cows would have required 10·4 lb. pasturage daily, and this would have supplied 1·5 lb. starch equivalent above their calculated requirements.

The cows receiving meat-meal were given, in the form of supplementary feed, 1·9 lb. less starch equivalent and 0·23 lb. less protein equivalent than their calculated requirements. To make up this deficiency of starch equivalent, the cows would have required 13·5 lb. pasturage, whereas to make up the deficiency of protein equivalent they would have required only 5·1 lb. pasturage daily. Possibly similar results could have been obtained by feeding a smaller quantity of meat-meal.

In August, 1936, feeding of meat-meal to all the milking cows was commenced, and since then quantities varying from 0·02 lb. in late spring to 0·56 lb. in mid-winter have been fed daily to each cow. Increases in milk-yield, particularly during the winter months, and in butter-fat content of the milk, have been recorded, while improvement in the health and condition of the cows has been observed also.

The average daily milk-yields per cow and the butter-fat content of the milk from July, 1935, until December, 1939, and the daily amount of meat-meal fed per cow per day since August, 1936, are shown graphically in Fig. 4.

At Werribee, the rainfall during 1938 was 14·60 inches (4·75 inches below the average), and, although a dry winter was favoured for winter milk production, milk yields were reduced during the following summer and autumn. This resulted from the poor growth and dry state of the pastures caused firstly by restricted irrigation, and subsequently by curtailment of irrigation altogether. The reduced and altered pasturage was met by feeding larger supplementary rations containing more meat-meal and, considering the dry state of the pastures, production was maintained at a satisfactory level. However, maximum yields were reached in November instead of the following February, and minimum yields in March instead of July. The drought broke on the 26th February, 1939, after which normal irrigation proceeded. The probable effect of the 1938 drought is shown by the differences between the dotted and solid lines for milk yield in Fig. 4.

Summary and Conclusions.

The milk-yield of a herd can be maintained fairly constant throughout the year by careful herd- and pasture-management and by suitable supplementary feeding.

The feeding of 1½ lb. of meat-meal per cow daily during June and July, 1935, to seven cows raised their milk-yield and increased the butter-fat content of their milk, whereas the milk-yield, and its butter-fat content, of six control cows decreased during the same period.

Since August, 1936, small amounts of meat-meal, varying from 0·02 to 0·56 lb. per cow daily, have been fed to all the milking cows. This practice has increased the milk-yield of the herd, particularly the winter yield, and the butter-fat content of the milk, thus supporting the results from the experiment conducted in 1935.

The meat-meal has not imparted any taint to the milk, and since it has been fed the cows have been in better health and condition.

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Live Stock Notes

Reminders for July—August

Compiled by A. C. T. HEWITT, M.Agr.Sc., Live Stock Science Officer

Potatoes as a Foodstuff.

POTATOES are an energy-producing or fattening food, and, in this respect, 4 lb. of potatoes have the same food value as 1 lb. of grain, pollard, or the various concentrated foods.

However, potatoes are deficient in protein, and to correct this deficiency, and so balance the ration, lucerne hay or chaff, linseed meal or nuts, meat meal or skim milk must be fed with potatoes.

The relative monetary values of potatoes as a stock food and the fodders that they are likely to replace in the rations, based on the present market price of pollard, are as follow :—

	£	*s.*	*d.*	
Pollard	6	0	0	per 2,000 lb.
Potatoes	1	15	0	„ 2,240 lb.
Wheat	0	3	9	„ bushel.
Maize	0	3	9	„ bushel.
Oats	0	2	2	„ bushel.
Oaten chaff	4	2	0	„ 2,240 lb.
Meadow hay ..	3	10	0	„ 2,240 lb.

The market prices for wheat, maize, oats, hay, and chaff are much higher than the relative values shown above; therefore, potatoes at £1 15s. per ton, or pollard at £6 per 2,000 lb., are considerably cheaper than wheat at 4s. 9d. per bushel, or oats at 3s. 6d. per bushel, &c.

Caution is necessary with green potatoes and potato sprouts, as they may be poisonous to all classes of live stock.

Pigs.—The potatoes should be boiled and fed to pigs in conjunction with grain or pollard and a protein supplement as follows :—

Each pig should be given ½ lb. of meat meal, or ¾ gallon of separated milk, and 1½ to 2 lb. of ground grain or pollard per head daily, and as many boiled potatoes as it will eat. As the pigs grow, more potatoes should be fed to satisfy their appetites.

Sheep.—A complete maintenance ration for the average sheep would be supplied by 3¾ lb. of potatoes and ¼ lb. of linseed nuts daily, or 3 lb. of potatoes and ¾ lb. of lucerne hay. However, these quantities may be reduced to ½, ¼, or even less, depending upon the nature and quantity of paddock feed. With green pickings, less linseed nuts or lucerne chaff may be fed with the potatoes.

Cattle.—Dry cattle should be fed similar rations to sheep, but each animal will require five times as much as each sheep. Milking cows will require additional food, containing more protein, for milk production, and to maintain milk yields, 4 lb. of meat meal, 16 lb. of linseed meal, or 50 lb. of lucerne chaff should be given with every 100 lb. of potatoes fed. The quantities of meat meal, linseed meal, and lucerne chaff may be reduced when green feed is available. Potatoes should be sliced or crushed before feeding to cattle.

Poultry.—Cooked potatoes can be used in the mash for poultry, and a mash made as shown below would be sufficient for 500 birds :—

Potatoes ..	50 lb.
Pollard ..	30 lb.
Bran	15 lb.
Meat meal ..	5 lb.

Dairy Cattle.

Those farmers who have sufficient fodder reserves to carry their herds through until the spring growth of pastures fully maintains the cows are now able to convert these reserves into cash. They will be envied by their neighbours who, through inability or less resourcefulness, are depending upon a particularly favorable winter or cheap purchasable fodders.

Oaten chaff and bran are the most commonly purchased supplementary fodders for dairy cows, and at £6 12s. 6d. per ton and £6 per 2,000 lb., Melbourne respectively, the dairy farmer who is selling his produce on a butterfat basis and who has to buy these fodders will have difficulty to show much margin between the cost of the feed and the return for the butterfat sold. Indirectly, however, it will pay such farmers to buy feed, because the cows will be kept in good condition and will milk much better

later, when the pasturage is sufficiently good to carry them. Furthermore, they will not have to fatten before they can produce their maximum inherent yields. There will be fewer deaths and culled cows will realize more money.

The manurial value of a feed is not often taken into account when a purchase is being made, but it should be remembered that all concentrates have high manurial values. For instance, the residual manurial values of bran and pollard vary from 25s. to 35s. per ton; of cereal grains from 15s. to 17s. 6d. per ton; and of cereal hay from 12s. 6d. to 15s. per ton on present unit fertilizer values.

To obtain the full benefit of the manurial values of fodders, the dung and urine should be collected and spread over the pastures and crop paddocks. A high-producing dairy cow excretes approximately 12 tons of manure (dung and urine) annually worth £9 12s. at 16s. per ton.

Those farmers requiring a new herd sire might take the opportunity of selecting a suitable animal before the spring rush of work commences, and before too many cows calve. Only bulls of strong constitution and good conformation from high milk and butterfat producing families should be considered when a selection is being made.

Sheep.

The Annual Sheep Show is being held at Dalgety's Wool Stores, Newmarket, from the 28th to 30th July, 1941. It will give persons interested in sheep an opportunity to make a study of the different breeds.

The Sheep and Wool Expert of the Department (Mr. N. A. Bowman) will be in attendance to give free advice and assistance, where required, in the selection and purchase of rams or stud ewes at the sale following the Show.

Horses.

The conditions governing the payment of the foal bonus in accord with the Government plan to encourage the breeding of draught horses are as follow:—

(1) A bonus of £2 will be paid to the owner of every draught foal the progeny of a Clydesdale, Percheron, or Suffolk Punch stallion registered under the *Horse Breeding Act* 1928, and a mare approved by the Department of Agriculture.

(2) **Approved Mares:**

(*a*) Mares must be the property of a Victorian Stock Owner and must have been served and have foaled in this State.

(*b*) Mares registered in the Commonwealth Clydesdale Stud Book may be approved without inspection.

(*c*) Subject to satisfactory proof, mares eligible for registration in the Commonwealth Clydesdale Stud Book may be approved without inspection.

(*d*) All other draught mares will be subject to inspection before approval.

(*e*) No mares will be approved unless the Chief Veterinary Inspector is satisfied that they are of a reasonable standard in respect of type, conformation and breeding.

(3) Foals must be alive at the time the application for the bonus is made.

(4) Application for the bonus must be made within three months of the birth of the foal, and such application must be made on the approved form.

Pigs.

Saving Labour on the Piggery.

The shortage of labour is already a serious problem on many farms, and even where pig-keeping is only a sideline to other farming activities, the time occupied in feeding and tending pigs is a considerable item.

The labour shortage, together with high food costs and low pig prices has influenced many pig-raisers in reducing their pig herds during the past six or eight months. The next phase in the pig market is likely to be a relative shortage of pigs, and higher prices which will encourage farmers to increase production where practicable. The labour problem is likely to remain acute, therefore farmers might give consideration to means of reducing the time necessary for feeding and caring for pigs.

On many piggeries there are numerous ways in which labour could be saved, and these ways are usually obvious to men who can set themselves

to think the matter out. Re-arrangement of pens, troughs and other equipment, and piping the separated milk from the dairy to the piggery would require extra labour, and probably material, but the initial expense on these may effect a big saving later.

One example of equipment to save labour is the oil drum drinking fountain which holds several days' supply of water for pigs. This and other equipment for the piggery are illustrated in the publication *Pig Housing and Equipment*, which may be obtained post free on application to the Director, Department of Agriculture, Melbourne, C.2.

[L. A. Downey, H.D.A., Pig Expert.]

Poultry.

Feeding Chickens.

Food and water should be given about 24 hours after the chickens are hatched, but the amount eaten will be small during the first day or two. Liquid skim-milk or buttermilk also may be given in addition to water.

When small numbers of chickens are kept it may be more convenient to use a reliable proprietary food mixture, owing to the small quantity required, but with large numbers, it usually pays to mix the chick feed on the farm. The chick feed may be varied considerably and both of the following mash mixtures have given good results :—

—	Mixture 1.	Mixture 2.
	lb.	lb.
Ground wheat	60	40
Ground hulled oats	40	20
Maize meal	40	80
Bran	20	20
Dried buttermilk	20	10
Meat meal	—	10
Common salt	1	1
Bone-meal, or 4 lb. dicalcic phosphate	6	6
Fine shell grit	5	5
Charcoal	6	6

These can be given either as a dry or wet mash. The usual custom is to have a dry mash always available, and to feed a wet mash a couple of times a day. It can be fed from the first feed when the chicks are about a day old until they reach maturity, or until they are well grown and then fed on an adult ration. For a separate grain ration, 60 lb. cracked wheat, 20 lb. cracked hulled oats and 20 lb. cracked maize make a very good mixture.

It is important that the chickens should receive as much tender green food as they can eat at least once a day. A liberal supply of fresh and clean drinking water should always be at hand. With proper management and a variety of plain wholesome foods, the chickens are usually provided with all the nourishment and vitamins necessary for their health and growth. In certain cases, and in the absence of greenstuff and exposure to direct sunshine, cod liver oil has been recommended as a vitamin supplement. If this is considered necessary it should be purchased from a reliable source and fed according to directions supplied.

Proper food and water vessels should be provided in order to keep the food clean and prevent waste, and they should be placed in positions where the chickens cannot walk into them.

If chickens are to do well it is important that they be bred from strong, vigorous and healthy stock. It should be remembered also that diseases, constitutional weaknesses, vices, &c., can be prevented by providing the chickens with comfortable quarters, clean floors and runs, proper heat and ventilation, outside exercise and sunshine, a correct diet with ample green food, and regularity in management. Practise strict sanitation, first, last, and always.

[H. F. Clinton, Poultry Expert.]

Bees.

Bees should be disturbed as little as possible and the apiarist should concentrate on the overhaul of his plant and equipment in readiness for the coming season. Migratory apiarists should examine the prospects of a good honey flow in other districts so that they will know where to move when the flow fails in a particular locality.

The prices of new and secondhand honey tins are increasing and beekeepers are advised to secure their requirements for the new season as soon as possible.

The Department of Agriculture publishes two comprehensive and well-illustrated bulletins, namely, "Beekeeping in Victoria," and "The Honey Flora of Victoria." These publications contain valuable information for all apiarists. The first-named bulletin covers all phases of bee husbandry from making a beehive to extracting the honey, while "The Honey Flora of Victoria" gives details of all the flowering plants of value to the apiarist. These bulletins may be obtained from the Director, Department of Agriculture, Melbourne, at a cost of 1s. 6d. each (postage 3d. extra).

[J. S. Eagland and J. W. Thomlinson, Apiary Inspectors.]

In the Orchard

By J. L. PROVAN, B.Agr.Sc., Senior Horticultural Instructor

THE cheapest method for the control of aphis on almonds, green peach aphis, and cherry aphis, is dormant spraying as late as possible before bud movement with tar-distillate, 3 in 100. Injuries to buds will result from later spraying. Depending on the season, almonds will require to be sprayed early in the month, peaches and cherries later. Growers who have not used tar-distillate previously are warned to protect their exposed skin by smearing it with lanoline. It is advisable also to wear goggles to protect the eyes.

For several seasons now growers have observed that, during early summer, the Aphelinus parasite has not been able to control woolly aphis effectively. Some methods of assistance are now necessary in order to encourage the parasite in its valuable work. One of the best and cheapest methods is the collection of laterals on which there are parasitized aphis. After pruning these can be heeled in the soil at the base of the tree. As soon as the weather becomes warm enough, the parasites will emerge and augment the population. This will ensure better control during the early part of the season.

When large wounds are made on plum trees there is a danger that the Silver Leaf fungus, if present in the orchard, will enter and ultimately destroy the tree. A wound dressing which is very effective in preventing the entry of this fungus has been developed at the East Malling Research Station, England. It consists of 2 lb. of white-lead paste, 2 teaspoonsful of paste driers, 2 tablespoonsful of raw linseed oil and 2 tablespoonful of turpentine. On properties where Silver Leaf is prevalent, it is advisable to coat all large wounds with this paste.

Where growers anticipate grafting their trees by frame-working methods, the pollarding or stripping of the laterals and spurs from the main branches should be done just prior to the grafting operation. Where it is not possible to complete all this work in a short period, some of the trees may be pollarded during the winter, but, if this method is adopted, it is advisable to retain a small number of uncut laterals and spurs on the top of each leader. It has been observed that trees with these untopped laterals will be in a condition to be grafted earlier than where complete removal of all laterals and spurs has been made. The lateral growth remaining at the tips can be removed either after all grafting is completed, or allowed to remain for a year. If occasional laterals and spurs are left, particularly on the north-west side, along the length of the limbs during pollarding, they serve as a protection against sunscald.

It is very necessary this year, to stress the importance of hygiene in the orchard. The large population of codling moth which appeared last

autumn, will be hibernating in all manner of hiding places in the orchards and sheds, and it can be expected that the spring brood will be one of the most severe with which orchardists have had to contend. Time spent in orchard sanitation means money saved in the spraying season. By reducing the over-wintering population, and secondly, by a rigorous attack on the early spring broods it will be found that later spray applications can be diminished in number without increasing the percentage of infected fruit.

In the Garden

By A. W. JESSEP, M.Agr.Sc., B.Sc., Dip. Ed., Principal, School of Horticulture, Burnley

PERENNIAL herbaceous plants should now be taken up and divided and the ground given a good forking over. If necessary, a good dressing of lime should be applied and the area replanted with the required herbaceous plants.

The winter-flowering annuals should be kept well picked, to prolong their flowering periods.

The present is a good time to plant deciduous trees and shrubs. The advantages of deciduous plants may be summarized as follow:—

They give variation in colour of foliage, and, if possible, should be placed in front of evergreen plants; many flower before the leaves appear, and sometimes brightly coloured fruits are retained into the early winter. The majority will stand pruning, and, during the leafless period, the soil can be worked up and the sun allowed to penetrate. When selecting plants for autumn-tinted foliage, the local conditions must be taken into consideration, for the leaves of some varieties burn badly with the hot north winds.

Flowering Cherry (Prunus Cerasus).

For the small garden, the decorative fruit trees are very useful, and vary in height from a few feet to 20 feet or more. The following are hardy under average garden conditions:—

The Prunus or Plum Group.

Prunus sinensis is the dwarf type, which grows to about 3 feet. It should be pruned hard back each year after flowering, so that it produces strong fresh growths on which the next season's flowers are produced. There is a white and dark-pink flowered form, called alba and rosea respectively. In the autumn, the leaves change to delightful autumn tints, and it flowers about September.

Prunus nigra is a medium-sized shrub with dark foliage. It is grown mainly on account of its bronze foliage throughout its leafy period.

Prunus bliriana produces double flowers of a bright pink colour, and is one of the best of the type. It grows to a height of about 8 to 10 feet, and flowers in August.

Prunus Pollardi was raised by Mr. Pollard, of Ballarat, and produces large single pink flowers. It is a robust grower, and, together with the other flowering plums, should be cut hard back after it finishes flowering in October.

The Flowering Apple and Cherry.

There are many beautiful flowering apples, including *Pyrus gorgeous,* a dwarf type producing masses of brilliant fruit in the autumn. *Pyrus eleyii* is a stronger grower, having purple-tinged foliage, purple flowers, followed by bright cherry-like fruits.

The cherries flower about October, and, where the conditions are suitable, they are well worth growing. As the variety names are usually of Japanese origin, they are mainly sold under flower-colour descriptions. Cherries are more suited to the moist hilly districts, and are not generally recommended for the greater part of Victoria. The apple and cherry flower on old wood, and do not require much pruning after they reach maturity.

Decorative Shrubs and Trees.

In addition to the flowering fruit trees, there are many other very decorative deciduous shrubs, such as *Rhus seccedanea,* the wax shrub. It grows to a height of from 5 to 8 feet, and the graceful foliage changes to a brilliant scarlet colour in the autumn. It requires a good open position. The climbing Rhus, also known as the poison ivy, should not be grown, as it causes a nasty skin rash on the majority of people who come in contact with it.

Viburnum plicatum tomentosum grows to a height of about 6 feet, and produces heads of creamy-white flowers in the spring and autumn. The leaves turn a rich bronze.

For the warmer climates, the Jacaranda, Erythrina—the Coral Tree—Poinsettia, Calodendron—the Cape Chestnut—and the Illawarra Flame Tree are all very beautiful trees.

In the cooler districts, the Liquidamber, Scarlet Oak, Maples, Rowan Tree, and Gingko —the Maidenhair Tree—are very attractive.

Vegetables.

Keep the soil well hoed around the growing vegetables, to allow the air to circulate freely. Make further sowings of broad beans and peas. Transplant such early cabbages as Eastham and Enfield Market. Prepare the ground for the spring vegetables, and make a sowing of Greenfeast peas towards the end of the month.

Plant some early potatoes, such as Early Rose and Carmen No. 1. Divide up the culinary herbs and replant as required. Although such culinary pea varieties as William Massey, Yorkshire Hero, English Wonder, Great Pod, Giant Stride, and others have been tried out in Victoria, the commercial growers have found Greenfeast the most suitable, and most of them plant this variety only. Yorkshire Hero was the popular choice some years ago, but it became unreliable and Greenfeast has taken its place. Experiments are being conducted to see if an improved variety can be obtained.

The main crop of culinary peas is sown from August to December, and they are ready for picking in from 21 weeks with the early sowings, and from ten weeks with the late sowings. Peas are not frost-tender, except in the flowering and podding stage. The planting should be carried out so that the frost-tender period of development will miss the frosty weather.

Plant the peas in rows from 24 to 30 inches apart and from 1 to 1½ inches deep. Peas respond to superphosphate, and it may be used at the rate of about 2 to 3 cwt. per acre or on small plots about 1 oz. per 3 yards of furrow. Do not place the manure alongside the pea seeds.

The peas should be kept growing, and hoed and watered as required. On an average, they take about fifteen weeks from time of sowing until ready for picking, and the same plot may be picked for about three weeks. Therefore, monthly sowings of Greenfeast should be made from July until January, so as to have a continuity of peas from about October, using early varieties such as English Wonder and William Hurst until the frosts, about June.

With a little careful forethought, the household can be supplied with vegetables throughout the year from the kitchen garden. With the present petrol restrictions, more time may be given to their cultivation with advantage to the householder both from a health and an economic point of view.

Certified Potato Seed

By J. T. Ramsay, Potato Expert.

FOR any crop the higher efficiency of selected seed has been abundantly demonstrated for many years, and now that certified potato seed stocks—Victorian grown—are available, growers have the opportunity of securing seed which will make for improved production.

In the face of the present low prices for potatoes, it may be contended that increased production would not be profitable. The obvious answer is that with improvement in production a smaller acreage could be utilized to supply requirements. Regulation of acreage for potato growing is out of the question because seasonal conditions are the main controlling factor influencing the aggregate yield. Potato growing, because of the variableness of climatic environment, has, and always will be, a gamble. Notwithstanding this, the use of seed of high standard is not only advisable, but is becoming increasingly important.

Stocks of seed, which, after careful examination, qualify for certification, are the buyers' only guarantee that they are securing the best possible strains of the varieties available.

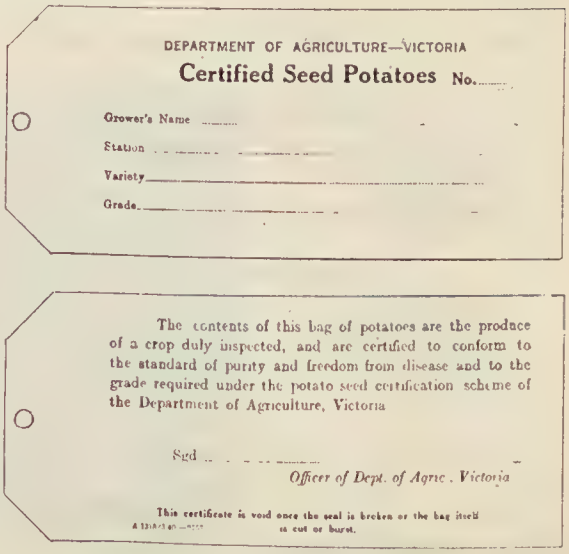
One hundred per cent. of varietal purity is aimed at, and it can be claimed that this has practically been obtained.

An extremely low tolerance of disease-affected plants is permitted in certified stocks, thus reducing the dissemination of undesirable seed. It is noteworthy that the majority of these certified stocks are from districts in the higher altitudes which are relatively free from the various virus troubles. Since these viruses are estimated to be the cause of probably 25 per cent. reduction in yield of the total acreage devoted to potato growing, not only in Victoria, but the whole of the Commonwealth, the benefits to be secured from the use of seed of relatively free virus infestation are manifest.

Appended is a list of growers whose crops have qualified for certification, together with the varieties grown by them.

In making application for quotations, intending purchasers should specify the grade of certified seed required. The grades obtainable are as follow :—

Small.—Potatoes of a size suitable only for being planted whole.


DEPARTMENT OF AGRICULTURE—VICTORIA
Certified Seed Potatoes No.
Grower's Name
Station
Variety
Grade
The contents of this bag of potatoes are the produce of a crop duly inspected, and are certified to conform to the standard of purity and freedom from disease and to the grade required under the potato seed certification scheme of the Department of Agriculture, Victoria
Sgd
Officer of Dept. of Agric., Victoria
This certificate is void once the seal is broken or the bag itself is cut or burst.

Label attached to each bag of certified potato seed.

Medium.—Whole seed size up to tubers which will cut to two or even three sets.

Run.—Whole seed size up to large tubers, i.e., the run of the crop with chats eliminated.

Large.—Tubers of sizes which will cut over three sets to the tuber.

An important point to be borne in mind is that potatoes intended for seed must be given correct storage conditions if they are to be maintained until planting time with unimpaired virility. This can be accomplished only by giving them abundant ventilation. Plenty of light, too, is desirable. These two factors, air and light in conjunction, will secure the desired condition of the seed at the end of the storage period.

Irrespective of whether potato seed is certified or not, all of it is subject to attack during storage by certain bacteria and fungi which cause deterioration, but, if the storage conditions are correct, the possible damage from these sources will be reduced to a minimum. For the control of various diseases to which the crop is susceptible, it is advisable that *all* seed should be treated prior to sprouting by dipping in a solution of

(1) Formalin, (2) Aretan, or (3) Corrosive sublimate. A bulletin published by the Department of Agriculture containing full information of these treatments and other cultural operations may be obtained on application to the Director, Department of Agriculture, for a sum of 5d. (postage included).

List of Growers of Certified Seed Potatoes, 1941.

Early Carman.

Auchterlonie Bros.	Narracan
Powell and Sons	Thorpdale
V. Wilson ..	Neerim Junction
Spring Bros. ..	Romsey

Late Carman.

J. F. Else ..	Romsey
C. Exton and Sons	King Lake
V. Wilson ..	Neerim Junction
W. H. Tann ..	Weeaproinah (Beech Forest)

Late Carman—*continued.*

A. M. Grove ..	Olangolah
J. Knox ..	Weeaproinah
Spring Bros. ..	Romsey
A. J. Towers ..	Beech Forest
F. Bellchambers	Beech Forest
Birrer Bros. ..	Beech Forest

Up-to-Dates.

Deppeler Bros. ..	Beech Forest
T. E. Macklin ..	Mollonghip
G. and J. Macklin	Mollonghip
J. A. Perry ..	Beech Forest
W. H. Tann ..	Weeaproinah
V. Antony ..	Cashmore, Portland
A. M. Grove ..	Olangolah
Spring Bros. ..	Romsey
J. Knox ..	Weeaproinah
A. J. Towers ..	Beech Forest
F. Bellchambers	Beech Forest
W. J. P. Congram	Beech Forest
Birrer Bros. ..	Beech Forest

Tubercle Free Herds

The following herds have been declared free of tuberculosis under the scheme conducted by the Department of Agriculture. Under this scheme a tuberculosis-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests, or, upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

ACCREDITED TUBERCLE FREE HERDS.

Name.	Address.	Number in Herd.	Name.	Address.	Number in Herd.
Ballarat Mental Hosp.	Ballarat	78	Onley, W. H. ..	"Glenholme," Caldermeade	67
Banyule Stud Pty. Ltd.	Heidelberg	34	Payne, A. E. T. ..	"Yarra View," Lilydale	77
Dennis, Mrs. A. A. ..	Frankston	19	Payne, T. E. N. ..	"Woodburn," Kilmore	58
Dookie Agricultural College	Dookie	78	Powell, T. S. ..	"Carellen," Mansfield	41
Dunbar and Clark, Messrs.	"Hazeldean Dairy," Mount Dandenong	15	Read, Estate, late John D.	"Springhurst Estate," Springhurst	112
Geelong Grammar School	Corio	58	Reid, Ralph G. ..	"Holmwood," Koowee-rup	78
Gorman, A. W. ..	"Cathcart," Alexandra	80	Richardson, Bros., Messrs.	"Faldinghurst," Upper Beaconsfield	30
Henderson, J. L. and E. I.	Wangaratta ..	95	Samuel, B. T. ..	Lang Lang ..	60
Holloway, R. W. ..	Caldermeade ..	56	School of Horticulture	Burnley	6
Lawrence, P. H. ..	"Rainga," Tarrawarra	60	State Experiment Farm	Rutherglen ..	51
Longerenong Agricultural College	Dooen	46	State Research Farm ..	Werribee	211

In addition to the above-mentioned herds there are 114 commercial dairy herds containing 3,587 head of cattle which may be considered free of tuberculosis. All these herds have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds, they cannot be considered as accredited under the accreditation scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

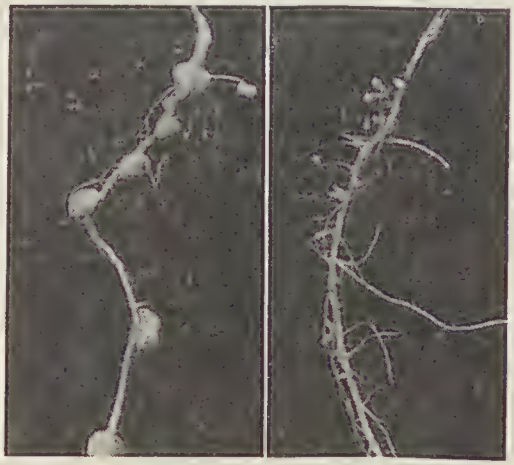
There are also 98 herds in which 5,343 head of cattle have passed one test, and may be considered therefore to be in process of becoming tuberculosis-free herds.

Ammonia and Nitrate

Supplying Our Soils with Nitrogen

By C. E. COLE, B.Agr.Sc., Horticultural Research Officer

THIS is a discussion chiefly of the virtues and disadvantages of two common fertilizers, sulphate of ammonia and nitrate of soda, as sources of that all-important plant food nitrogen, particularly for fruit and vegetable crops. But first we should know a little about nitrogen in general.



Bacterial nodules on roots of lupin (left) and sweet-pea (right)

Nitrogen makes up about four-fifths of the air, and, since it is estimated that there are 5,100 billion tons of air around the earth, there should not be a shortage of nitrogen. Ordinary green-leafed plants, however, cannot make direct use of this nitrogen, but in nature must depend on the activities of certain bacteria. Some kinds of these bacteria live in the roots of leguminous plants, such as peas and beans, while other types live free in the soil. Those that live in roots can take nitrogen from the air, combine it, and pass it on to the plant. That is why cover crops of peas and beans increase the nitrogen content of the soil. The bacteria living free in the soil also can take in free nitrogen, but they build it into their own bodies, and it is not until they die and their bodies are broken down by other bacteria that the nitrogen is converted to a nitrate and is ready for use by plants. Most of the nitrogen in the soil is fixed by the bacteria associated with legumes.

The nitrate absorbed by the plants is built by them into proteins. When the plants die, they in turn are decomposed, and the nitrogen may be released into the air, or absorbed as nitrate by living plants replacing those that have died. There are a number of other courses which the nitrogen may follow. For instance, the plants may be eaten by an animal, the plant proteins converted into animal proteins, and eventually excreted; or the nitrate may be washed out of the soil by rain. A vast amount of nitrogen is lost from the soil by this process of leaching. Eventually however, the bulk of it returns to the atmosphere.

When man comes along, he usually increases the loss of nitrogen from the soil by removing the plants or their produce altogether. He may or may not make good this loss. If he does not, the soil loses its virgin fertility. So it is that nitrogen, one of the most essential of plant foods, is very often lacking in cultivated soils. It is an undoubted fact, and one which cannot be repeated too often, that the best way nitrogen and most other plant foods can be applied to orchards and gardens to remedy a deficiency is in the form of some animal manure. Supplies of such manures being so difficult to obtain, most growers have no alternative to using green manure crops and fertilizers instead.

Nitrogenous Fertilizers.

It is over a century now since nitrogen was first added to the soil in the form of a fertilizer, as distinct from animal manures, thus short-cutting nature; but it is only during the last decade that its paramount importance for fruit and vegetable growing in Victoria has been recognized. It is now common practice—and good practice—to use up to 4 cwt. of a nitrogen-bearing fertilizer per acre for deciduous fruit-trees, vines, and vegetables, and up to 8 cwt. per acre for citrus trees.

Quite a number of nitrogenous fertilizers are available in other countries. There is calcium nitrate, for instance, sometimes called nitrate of lime, which is perhaps the ideal fertilizer

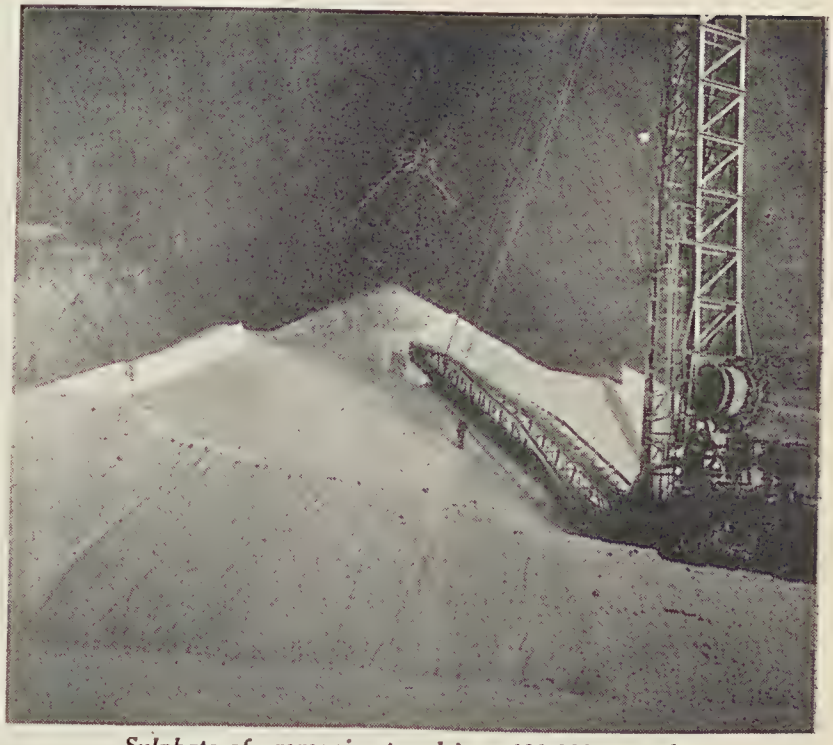
A Chilean nitrate-processing plant.

because it is probably taken in by the plant as it is, and because it has only good effects on the soil. Its use is increasing rapidly overseas. Ammonium nitrate is useful because it contains 35 per cent. of nitrogen, some of which is immediately available to the plant and the rest is available in a few days. It is easily made, but, unfortunately, it has a tendency to explode under certain conditions. In 1921 it was responsible for the destruction of a European village. Ammonium phosphate, containing both nitrogen and phosphorus, is also valuable, while urea is notable because nearly half of it is nitrogen. Then, of course, there are the two fertilizers we know so well, nitrate of soda, which supplies about one-tenth of the nitrogen-carrying fertilizers used in the world, and sulphate of ammonia, which supplies just on one-half of them. These two are the only common ones in use in Australia.

Ammonium sulphate, which is approximately one-fifth nitrogen, used to be made chiefly as a by-product at gasworks, and it is still produced in that way in Australia. In other countries most of it is now made by combining the nitrogen of the atmosphere with hydrogen to form ammonia. This in turn is combined with sulphuric acid to give a sulphate of ammonia of much more desirable quality than the gasworks product. In 1937 the world production of sulphate of ammonia was 1,061,000 tons—407,000 tons from gasworks and 654,000 tons from the "fixation" process, as it is called. In 1939 Australia consumed 52,000 tons, but produced only 17,000 tons, the balance being imported.

Excavating crude nitrate of soda, Chile.

Nitrate of soda is about one-sixth nitrogen. The world consumption of this fertilizer is about 240,000 tons per annum. It is a natural product found only in the almost rainless areas of northern Chile. It is interesting to note that, until quite recently, no rain had fallen there within living memory, but a short time ago heavy rains and floods gave the inhabitants something of a surprise. The nitrate of soda is dug out of the ground, purified, and marketed.



Sulphate of ammonia stored in a 100,000 ton silo.

Experiments conducted in many parts of the world have indicated that nitrate of soda generally gives an increase in yield one-tenth greater than does sulphate of ammonia when both fertilizers are put on in quantities which supply the same amount of nitrogen. This is equivalent to saying that, under normal conditions, nitrate of soda is a more efficient source of nitrogen for plants; but that does not mean it is a more *economical* source of nitrogen, for then we come up against the question of prices. Before the present war, a given quantity of nitrogen in the form of nitrate of soda cost over half as much again as it did in the form of sulphate of ammonia, and it was then more economical to use the latter. Even at present, when the price per ton of sulphate of ammonia is higher than that of nitrate of soda, the unit cost of nitrogen in nitrate of soda is one-fifth dearer. Therefore it still is more economical to put on a one-tenth heavier dressing of sulphate of ammonia to get the same effect as from nitrate of soda. However, it is possible that, under the stress of present import difficulties, the prices of the two fertilizers may change further so that the cost of a unit of nitrogen is the same whether it be in the form of ammonia or nitrate. Then it would become equally profitable, if not more so, to use nitrate of soda, and our decision as to which to use would have to be based on other factors. Let us consider these factors more fully.

The Effects of Nitrogenous Fertilizers.

First, there is the reaction of the soil; that is, whether it is acid, neutral, or alkaline. Sulphate of ammonia combines temporarily with certain components of the soil during the conversion of the nitrogen to nitrate so that the plant can use it. The net result of the various changes which take place is that an equal weight of lime is used up. If there is no free lime in the soil, calcium is taken from the clay, which as a result becomes less friable. Unless this loss of lime is made good, the soil tends to become acid over a period of years. This risk is reduced by the presence of plenty of organic matter in the soil, and it can be completely prevented by small dressings of lime. Where lime cannot be obtained it is unwise to apply considerable quantities of sulphate of ammonia to acid soils.

Nitrate of soda has the opposite effect. It will prevent acid soils from becoming more acid, but at the other end of the scale it tends to make alkaline soils more alkaline. Where there is danger of salt in the soil it is wise to avoid the continued use of nitrate of soda. This applies to many of our irrigation areas along the River Murray. In heavier soils, too, nitrate of soda may cause the clay to break up into very fine particles and be washed down to the subsoil, where it may form a claypan. As our Goulburn Valley irrigators in particular

know, a claypan is very undesirable, because it limits the penetration of water and plant roots.

These are long-term effects, and may become apparent only after using the fertilizers for a decade or more, but every wise farmer knows that he must preserve his soil in the best possible condition, not only for his own profit, but for the sake of the generations that will follow him. Fortunately, most Victorian soils are neutral, and either fertilizer used wisely, will not harm them, so that we can pass on to the immediate effects of the fertilizers.

Gas compressors in a nitrogen fixation works.

Nitrate of soda has a very rapid effect on plants. Under favorable conditions its effects may be seen in two or three days. It is, therefore, very useful as a top-dressing, particularly for the leafy vegetable crops. The effects of sulphate of ammonia are not evident until six to ten days after its application. This period may be longer in cold weather, because the conversion of ammonia nitrogen to nitrate nitrogen depends on the activities of soil bacteria, which in their turn depend on warmth and moisture. Nitrate of soda, therefore, has a special value for cold or dry soil conditions. On the other hand, sulphate of ammonia, because it combines temporarily with certain parts of the soil, is not so readily leached out by rain and irrigation water as nitrate of soda is, and its effects are spread out more. Its best uses are as a dressing for vegetables at planting time, as a spring dressing for orchard trees, and for fertilizing in regions of heavy rainfall where leaching is bad.

The purer forms of sulphate of ammonia remain dry and free-running under normal storage conditions. Some of the gasworks product contains impurities which absorb moisture from the air and make the fertilizer cake. Nitrate of soda will always become damp and cake unless it is stored in air-tight bags, like cement. For this reason it is not as suitable as sulphate of ammonia for mixing with other fertilizers.

Nitrate of soda contains, in addition to nitrogen, minute amounts of other essential plant foods, like iodine and borax, but this has not been proved to be of any practical importance, and is not likely to be in Victoria.

As mentioned earlier, once costs become equal it is on these other factors of soil, climate, and purpose that we must make our choice between ammonia and nitrate; but the same factors which may equalize the costs also make it imperative to economize in the use of both of these fertilizers. It is the duty of every fruit-grower and every gardener to make the fullest use of leguminous cover crops and all animal refuse, so that his requirements and the Australian importation of artificial nitrogenous fertilizers may be kept at a minimum.

Payment For Quality

Problems of Fat Lamb Production

A Presidential address by Mr. W. B. MILLER, M.Agr.Sc., Senior Inspector of Agriculture, to the Australian Institute of Agricultural Science (Victorian Branch), May, 1941

PAYMENT for quality should be one of the major considerations in any scheme of organization, rationalization, or regulation of Australia's primary industries brought about by the war or by over-production. Payment for produce on a scale approaching a flat rate is an almost unsurmountable bar to appreciable quality improvement, and conflicts sharply with generally approved and adopted business practice. It is unjust also to both producer and consumer, and often encourages over-production.

An attractive pen of Leicester cross fat lambs. Average frozen weight 38·8 lb.

For many years two slogans of agriculturists have been "More produce the better quality" and "Reduced costs of production." Both appear to be very desirable for the prosperity of a nation partially dependent on the maintenance of its primary industries, particularly exports, and great progress along both lines has been achieved.

The combined efforts of the producer, agricultural scientist, engineer, and many others concerned in the production-marketing chain have resulted in tremendous and well-known advances in volume and also in quality. Particularly is this so when a change of practice to increase quantity also improves quality, e.g., new wheat varieties superior in both yield and bread-making quality, and the use of English breeds of sheep in fat lamb production.

Wool, wheat, butter, meat, fruits, sugar, &c., all show production increases over the past twenty years, and who can say what are the upper limits?

This country has not been alone in discovering the potentialities of its soil. Such rivals as the United States of America, Argentine, and Canada have all joined in the race; and even some countries of Europe, cultivated for centuries, have, under economic nationalism, revised their former conception of dependence on imported foodstuffs by their realization that both soil use and farm management could be immeasurably improved.

Great Britain is a notable exception, for, although its agriculture can be and is being stimulated under stress of war conditions, full requirements cannot be produced or even approached. In this great market intense competition existed. To protect both its agriculturists and favoured suppliers, various quotas and price levels have been established from time to time, the results following the Ottawa Conference being outstanding examples.

In the welter of discussion, agreements, and quotas, quality has received consideration, but not sufficient to forcibly influence many of the producers. High quality produce does and will receive some preference, and on a limited and competitive market it is usually desirable to achieve as high a standard as practicable.

This at least is and has been the aim; but a realistic view is not always taken by those responsible, each section of a trade naturally not wishing to suffer even temporarily from new procedure, nor in some cases being willing or able to change its established practice, quickly or without loss.

Slavish adherence to the principle of payment for quality is not suggested, but each industry, the Government, single or combined merchants, and Boards and producers must themselves, and through their appointed agents, be prepared to recognize quality where it is likely to count, and to assess its importance. Greater recognition of quality involves publicity on the subject to both the producer and the consumer. Many difficulties will be experienced, because the purchaser does not always clearly comprehend the importance of specifying quality when he makes his purchase, and discernment is not always used. For example, how many housewives really describe and obtain from the butcher the meat they desire? They may even ask for tender lamb chops and be satisfied with mutton. The bone and fat thrown away is often not appraised, and as a result the producer at his end of the chain is not encouraged to think in terms of quality.

With regard to bacon, it is only very recently that the producer has realized that few over-fat pigs are required, or even what an over-fat pig really is.

It is not suggested that apathy on or ignorance of the value of quality is universal, but the interest and education of the consumer requires consideration. This applies both to overseas and Australian consumers.

In England the purchaser of meat is probably more discriminating. Demands vary according to district, size of family, hotel, or cafeteria, and also with the occupation of the consumer. In spite of this, until very recently, real values of different types of lamb were not transferred completely to the Australian farmer. In 1937 it was difficult for him to obtain ¼d. per lb.—i.e., 5 per cent.—more for choicest Down type lamb than for lamb barely reaching what is termed first grade, and the over-fat lamb was included as choicest when in reality it was wasteful. The exporters or the big meat distributors may have satisfied their customers, but no big improvement can be expected in the production of quality unless it is adequately paid for. To say Smithfield wants "this" or "that" means little to the producer, but it is definitely in the interests of the industry that the requirements of the competitive markets be fully considered and met.

With other meats similar conditions prevail. Exporters buying against local competition naturally do not have to pay much more for the quality product than local buyers, and are not very interested in suggestions to subsidize the superior article. This is not necessarily because they do not believe it desirable, but rather that they consider their own immediate purposes more important. The volume of turnover and margin of profit are naturally their main interests.

In wheat, as with meat, quality is rather difficult to define. If we say high quality is that quality best suited to the market and purpose catered for, then it is variable according to the markets supplied. Furthermore, type is distinct from purity—for example, with wheat for export the baking quality of the flour must be considered separately from the purity of the sample, i.e., the percentage of millable wheat, and excluding foreign matter. For years the wheat industry has permitted the existence of from 3 to 8 per cent. of unmillable grain and foreign matter (straw chaff, weeds, and cracked grain) as normal in the marketed product, and usually has paid the producer of 100 per cent. wheat the same f.a.q. price as the man marketing 6 per cent. of rubbish with his grain. Reports, plans, conferences, &c., all approving the principle of payment for quality have had little effect. Why is this so? Mainly because it is regarded as impracticable to penalize the offender. Of course, even the rubbish has its value, but the average price of Australian wheat must be affected by the inclusion of matter other than millable grain, and to pay freight on straw and weed seeds is surely unnecessary.

Australia is one of the few exporting countries not selling by grades. They could well be introduced to cover both purity (by grades) and flour quality (by two types, medium and soft white).

Reports on the butter industry show how much room there is for quality improvement, but here again the differential prices paid for grades of cream are insufficient to force an improvement. It may be that complete rejection of the low quality product of either the farmer or factory will be the solution, but this is unlikely while a market

exists for all that is available. Education and persuasion alone are not sufficiently effective to deal with the situation.

Unwillingness of the trade and the producer to realize the significance of quality in a competitive market is again the main fault, and this applies with many other forms of primary produce also, wool being a notable exception.

When all produce is saleable at a high or even a low price, it seems that the present system can continue, and will do so unless a firm stand is made by producers. The position is not the same in secondary industry. Producers there are more closely organized and combined, and, generally speaking, are the "few selling to the many" rather than "the many selling to the few." Monopolistic selling can standardize quality according to the production and selling programme. The standard article, good or mediocre, may be all that is offered until competition from a substitute forces improvement. Under regulated marketing conditions (involving close governmental control) now and in the future the opportunity is given for more recognition of payment for quality of agricultural produce. Educational campaigns and improved extension systems must be backed by implementation of the principle of payment for quality. It is in the national interest to do so, to maintain and improve the quality of both locally-consumed and exported produce.

Problems of Fat Lamb Marketing.

In recent years Australia has exported approximately 65 per cent. of the lamb and 10 per cent. of the mutton slaughtered, i.e., 6,000,000 carcasses out of a total of 18,000,000.

This pen of Southdown cross fat lambs averaged 33·9 lb. frozen weight.

The growth of the export of lambs from Victoria is shown by the following figures, covering five-year periods up to the war commencement:—

Years (ended June).	Lambs Exported from Victorian Ports (approx.).
Average five years—	Carcasses.
1919-20–1923-24	1,033,000
1924-25–1928-29	1,080,000
1929-30–1933-34	1,868,000
1934-35–1938-39	2,939,000

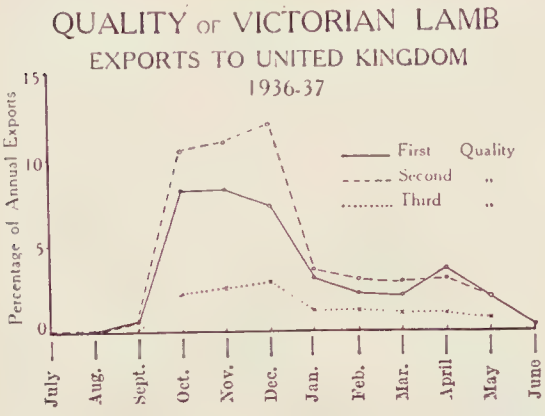
In 1939-40, an abnormally favorable year following a drought, 2,933,079 lambs were exported from Victoria, at the record average weight of 38 lb. (frozen weight).

The above exports include a large but indefinite number of lambs from New South Wales which were slaughtered in Victoria, and also lesser numbers from South Australia and Tasmania. Approximately 1,500,000 lambs are used annually for local consumption in Victoria.

These figures indicate that there are many new-comers to the industry. Before the declaration of war, the trade and producers were faced by the problem of surplus production. In the year ended 30th September, 1939, imports into the United Kingdom of both Australian and New Zealand mutton and lamb had to be reduced by 3 per cent. below the level of the preceding twelve months and foreign supplies by 10 per cent., i.e., a quota had been imposed. Actual restrictions did not result, the season being comparatively unfavorable.

Shortly after the commencement of war Britain wished to take all the meat Australia could produce, contracted to buy 240,000 tons, and actually took very much larger quantities. For the current season 249,000 tons, f.o.b., were contracted for, but owing to the restricted shipping position this was reduced to 198,000 tons in January and later to 144,000 tons. Recently Britain agreed to take the full 198,000 tons if ships are available, but it is by no means certain that they will be.

There seems to be little doubt that in the spring there will be a surplus of lambs ready



for market over and above what can be used by the local trade, plus additional freezing storage space which is being provided. The Federal Government has announced that steps will be taken to protect the industry. Up to 9th May no details had been announced except that the Government will purchase the whole of the permitted export classes of lamb, and will buy canned mutton. Low prices will follow on the open market, although some authorities consider that a glut can be prevented. Whether that be so or not, it is probable that the Government will, in effect, become the buyer of meat for export at least, and will fix the prices it will pay. This probably will be much less than the Australian equivalent of the contract price with the British Government. It is as yet uncertain, therefore, whether the margins for quality paid last year will be maintained in the coming season, or whether the principle of payment for quality will be adhered to.

It will be remembered that first quality lambs were bought for export at from ½d. to ¾d. per lb. more than second quality lambs last October, and third quality lambs were ½d. per lb. lower still. At the same time heavy lamb over 36 lb. freezing weight was less valuable than light lambs by only ⅛d. per lb. in the first quality classes, but lambs over 50 lb. were not permitted to be exported as lamb, resulting in their diversion to the local market. From February the following classes of lamb were debarred from killing for export:—

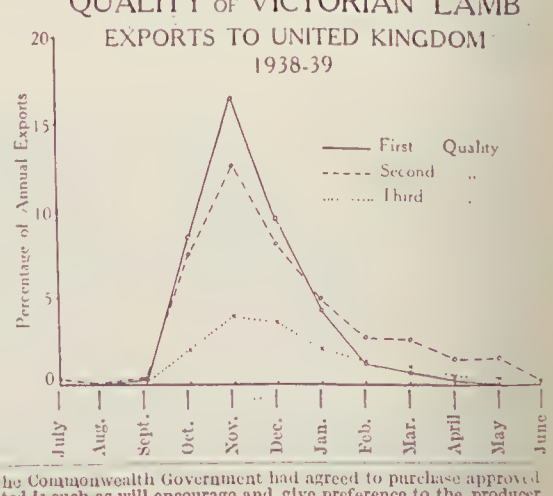
1. First and second quality lamb over 42 lb.
2. Third quality lamb over 28 lb. and all qualities under 23 lb.

Restrictions in other meat classes were made also. The application of such a scale restricts, for all practical purposes, killings for export to lambs between 28 and 42 lb. In actual practice on the farm it would be necessary to draft very carefully and to consign frequently to avoid penalty by the marketing of over-weight lambs, and the net result would be that lambs would be marketed very much earlier than usual. Export buyers would have to allow in their prices for errors of weight estimation, and even well-drafted pens of 36 to 38 lb. weight may bring as much as uneven pens averaging 40 lb.

If, in addition, a much higher price is paid for first quality than second quality—say ¾d. per lb.—the producer of the ideal type of lamb will suffer the least. In other words, payment for quality *will be achieved*.* It is assumed, of course, that the prices paid by buyers of meat for local consumption will be much lower than those obtainable for the permitted export classes, as otherwise there will be little inducement to either sell at lower weights than usual or to aim at improved quality.

That there is room for improvement in the quality of our lambs is shown in the accompanying graphs of export in the two years 1936-37 and 1938-39. Nevertheless, Victoria exports higher quality lambs than any other State except Tasmania (a comparatively small exporter).

In recent years the producer has been bewildered by the repeated changes in the price schedules, due to the rapidly-changing war



* On 17th June the Australian Meat Board announced that the Commonwealth Government had agreed to purchase approved grades and weights of export lamb at fixed prices. The schedule adopted is such as will encourage and give preference to the producer of light-weight quality lamb. It was announced also that "Production in future must be decreased."

market conditions. Just before the war he was advised to market light lambs. Shortly afterwards big heavy lambs, if they were well finished, gave the highest return. The next season heavy lambs were barred from export as lambs, and now the decision of the Government is awaited. The Chairman of the Australian Meat Board, however, has announced that high-priced lambs should receive first preference, and, if this policy is carried right through, it can be assumed that the well-finished light-weight lamb will be the best and most payable type to produce. Once the producer realizes that it will pay him to produce high quality lambs, and that those of low quality might even be unsaleable, some adjustments in production methods such as those enumerated hereunder will follow:—

1. There will be a change in breed policy toward a further increase in the use of superior Down type rams and better ewes.

2. Overstocking will be avoided, because it will pay to produce three good lambs rather than four second or third quality lambs.

3. Fodder conservation will be encouraged to ensure adequate feeding, particularly of the ewe mother before lambing.

4. Producers in marginal areas will be forced either to return to wool growing as the main objective or to stock more conservatively and be prepared for regular hand feeding as a part of their practice. This would be no more costly than pasture improvement in wetter districts.

5. Pasture improvement will be encouraged if found economical at new price levels, and if individual quotas are not imposed.

6. Total production of fat lambs will decrease until the market increases following resumption of normal trade and greater Australian population.

Regarding marginal areas—i.e., those which cannot regularly and economically produce a high percentage of at least average quality lambs—it seems that such areas will tend to go out of lamb production. With lower prices also it may not pay to top-dress pastures for fat lambs, although this is a moot point. On the whole, however, it is probable that top-dressing will decline, and, as approximately 50 per cent. of Victoria's fat lambs are produced on top-dressed pastures, this will result in a decline of production.

It may seem idle to consider very deeply competitive trade after the war, but it must be remembered that both New Zealand and Argentine have realized the importance of quality improvement for many years. In the years 1937-38 and 1938-39 New Zealand supplied 53 per cent. of the United Kingdom lamb and mutton imports, Australia 27 per cent., and Argentine 13 per cent.

To deal with the immediate problem of the coming season, there appear to be three main objectives, namely:—

1. To have available for Britain, at short call, plentiful supplies of meat to fill such ships as are provided. Storage of meat in the augmented freezing works should guarantee this requirement.

2. To maintain the fabric of the industry so that, as more shipping is available when Britain gains greater control of the seas and in the post-war period, production to fill the market will be forthcoming.

3. To organize in advance so that all producers are equitably treated and, if necessary, financially supported. The Government cannot shield agriculture entirely, but it can plan to prevent producers being hit in a haphazard manner. The problem is certainly a national one.

The uncertainties of the future make such planning very difficult. Recent statistics show that there are in Victoria alone 18,351 sheep-owners who, as users of British breeds of rams in their lamb production, may be regarded as genuine and potential fat lamb breeders. To this number must be added some others breeding fat lambs or mutton in other ways, and also regular fatteners and dealers. In Victoria 15,000 of the so defined fat lamb producers market only a few hundred lambs each year. In the whole of Australia there must be nearly 40,000 fat lamb growers. They are not organized in an association, but the producer representatives on the Australian Meat Board are, no doubt, earnestly planning on their behalf.

To apply individual marketing quotas to each producer appears impracticable, although it is an obvious suggestion if reduced marketing is found to be necessary. To police such a scheme would be difficult indeed, as sheep, unlike acres of crop, are continually

[Continued on page 354.

Brucellosis of Swine

Herd Accreditation Scheme

By C. POPE, B.V.Sc., Veterinary Officer

IT has recently come under the notice of the Department of Agriculture that brucellosis of swine is present in Victoria. Such a discovery is of no small importance and the influence of the disease on the Victorian pig industry may have far reaching effects. Already restrictions have been placed on the interstate movement of pigs and societies controlling the showing of pigs are demanding that exhibits shall be accompanied by a certificate certifying freedom from brucellosis. So far, in Victoria the extent of the disease is not known, but a survey at present being made indicates that it is not, as yet, widespread.

This article has been prepared as a warning to farmers of the serious nature of the disease and to explain symptoms which would give rise to suspicions of its presence so that measures of control and eradication can be instituted. Brucellosis of swine has been proclaimed under the Stock Diseases Act. This makes it incumbent upon every owner who suspects the presence of the disease in his herd to report his suspicions to the Chief Veterinary Inspector.

Nature of the Disease.

Brucellosis of swine is a contagious disease caused by a germ known as *Brucella suis*, which invades many body tissues and causes damage especially in the genital organs of both sows and boars. The disease also has been called contagious abortion, but as many affected pregnant sows carry their litters to full term and raise apparently healthy young pigs, this is a misnomer and the act of abortion is merely a variable clinical symptom.

Symptoms.

Brucellosis in a pregnant sow may cause abortion and perhaps this is the most spectacular symptom, but the more common results of the disease are the farrowing of weak, runty, and even dead piglets, and a subsequent apparent sterility. Much difficulty is experienced in getting the sows in pig and in some cases repeated services over periods of up to six months have failed to achieve their object. In contra-distinction to accidental abortion, abortion due to brucellosis is usually heralded by some more or less pronounced symptoms. The udder and vulva of the sow may enlarge and there may be milk in the teats. If she is in a paddock the sow may prepare a place in which to farrow; a vaginal discharge may also appear about a day or so before the abortion. To appreciate these symptoms the normal farrowing date must be known. Whether farrowing at due time or aborting, parturition may be protracted, and the membranes may be retained. Following parturition there is usually a vaginal discharge lasting several days.

Rarely are there any obvious clinical symptoms evident in the boar. The size of one or both testicles may alter. A swelling may be noticeable in the early stages and atrophy or diminution in size may be observed in advanced cases, but a poor breeding record is the most reliable and often the only evidence of infection.

Spread of the Disease.

The introduction of the disease to a hitherto clean property is usually effected by the purchase of an infected breeding animal. The disease can also be initiated by the introduction of any contaminated or infective material. Once the disease is introduced, the boar is recognized as being of supreme importance in spreading it amongst the remainder of the breeding stock. Brucellosis is readily transmitted from boar to sow, and vice versa, at service. It may be appreciated therefore that the introduction into a breeding herd of an infected animal will be followed by severe consequences. Infection may also result from the ingestion or swallowing of infective material from contaminated surroundings, and it is worth noting that the discharges from a sow at or following parturition are particularly dangerous and, further, that germs may be excreted in the urine of both sow and boar.

Control.

While clinical symptoms may indicate that the disease is existent in a herd, the only sure method of diagnosis is by a laboratory test of the blood, and as there is no cure for brucellosis of swine control depends essentially upon accurate diagnosis, followed by isolation and disposal of the diseased animals and the prevention of further introduction or spread. Measures of disinfection would necessarily be associated.

Conclusions.

The potential seriousness of brucellosis to the pig industry of Victoria can, as yet, only be conjectural, but experience of the disease in other countries and of early outbreaks in Victoria, supply sufficient evidence to show that it can attain to very serious proportions. It therefore behoves every one with an interest in the pig industry to do his utmost, in his own sphere, to control and eliminate the disease. To the individual the disease means losses through abortions; through the delivery, at a full term parturition, of weak and runty piglets, which may or may not live through to weaning stage; and through that period of apparent sterility when sows fail to get in pig and so distort production figures. In a broader sense, the industry will suffer through increasing restrictions of interstate and overseas traffic in pigs and through an increasing loss of confidence in markets. The remedy lies largely in the hands of the pig owners, as it is only by their reporting the existence of the disease to the Chief Veterinary Inspector that control measures can be instituted.

Accreditation.

A scheme of accreditation has been initiated by the Department of Agriculture, by which breeder's herds, when proved free of the disease, will be advertised in the Victorian Agricultural Journal under the title "Accredited Brucellosis-free Herds (Swine)". This scheme will automatically act as a protection to owners of clean herds and as a measure of control of the spread of the disease. It will inspire confidence in a market for breeding stock, as accredited herds will form a nucleus from which disease free stock can be purchased with confidence.

Recognizing the importance of this disease to the industry and the value of accreditation, the Australian Stud Pig Breeder's Society (Victorian Branch) has ruled, that, for its forthcoming show to be held in September, all entries must originate from accredited brucellosis-free herds.

The conditions of accreditation are as follow:—

1. The owner shall supply to the Chief Veterinary Inspector prior to the commencement of the test a complete list of all swine and the method used in identifying same, and, before such testing commences, the Chief Veterinary Inspector shall be satisfied that the premises and equipment are such as will allow of the conditions hereunder being complied with.
2. All swine over weaning age in the herd shall be submitted to such diagnostic tests for Brucellosis of Swine and at such times as specified by the Chief Veterinary Inspector.
3. All diagnostic tests shall be carried out at the Veterinary Research Institute.
4. Each animal shall be marked, for identification purposes, to the satisfaction of the Chief Veterinary Inspector.
5. The owner shall immediately isolate or otherwise dispose of as required by the Chief Veterinary Inspector all animals which fail to give a negative reaction to the test.
6. The herd shall be declared to be Brucellosis-free after all animals therein have been subjected to two (2) tests with negative results, at intervals prescribed by the Chief Veterinary Inspector.
7. A semi-annual or annual re-test as required by the Chief Veterinary Inspector, of all animals in the herd shall be conducted after its declaration as Brucellosis-free.
8. If, at a semi-annual or annual re-test animals which fail to give a negative reaction to the test are found in the herd, the herd shall not be declared Brucellosis-free again until two tests of the complete herd have been carried out with negative results.
9. No animal shall be introduced into a Brucellosis-free herd without the previous permission of the Chief Veterinary Inspector. Before such

permission is given, the animal to be introduced shall have :—

(*a*) been twice tested by a Government Veterinary Surgeon, or a Veterinary Surgeon approved by the Chief Veterinary Inspector, with negative results, the interval between such tests being not less than thirty days. In the interval between these tests, the animal shall have been maintained in isolation to the satisfaction of the Chief Veterinary Inspector;

(*b*) originated from a herd which has been proclaimed to be Brucellosis-free by the Chief Veterinary Inspector.

10. If an abortion occurs, the aborting animal must be isolated and the Chief Veterinary Inspector notified immediately, and the foetus and after-birth placed in a clean receptacle. Should the animal react to the agglutination test, the whole herd will be required to be re-tested.

11. No animal from a Brucellosis-free herd which has been in contact with untested swine or swine which have failed to give a negative reaction to the test, shall be re-introduced into a Brucellosis-free herd until it has given negative reactions to two tests at intervals prescribed by the Chief Veterinary Inspector.

12. This agreement may be cancelled at any time by the owner or the Chief Veterinary Inspector.

13. There shall be published in the Journal of Agriculture, Victoria, a list of those herds in connexion with which the terms of this Agreement have been carried out under the title "Accredited Brucellosis-free Herds (Swine)".

PROBLEMS OF FAT LAMB PRODUCTION—*Continued from page 351.*

moving. In the event of a real glut of lamb, which the Government hopes to avoid, and as an emergency measure designed to spread a blow evenly amongst producers, it should be practicable to prohibit the killing of ewe lambs for export. All sales of wether lambs for export could be direct from the paddock or country agents, who would assemble and appraise small lots. Producers could also sell by auction in the usual way if they wished, but it is anticipated that sales over the hooks would be more remunerative than those at auction. The inconvenience so caused would be negligible compared with the problem of applying market quotas in other ways.

The ewe lambs could be retained on the farms for breeding purposes or sold on the open market (at low prices, probably) or, if desirable, retained for sale as late lamb or mutton. Such a measure would be in addition to those already proposed, involving killing at lower weights and giving preference to quality. It would operate only if absolutely necessary and to relieve a desperate position in a manner as equitable as possible to all producers.

If the Government desires to maintain any surplus production on the hoof, financial assistance may have to be given. The wheat country could absorb stock in a good year, as could the irrigated and heavy rainfall districts, particularly with heavy top-dressing of pastures. Old ewes could be disposed of and replaced by ewe lambs for use later, and breeding on the usual scale next season could be discouraged, if necessary.

The question of quality improvement may appear to be overshadowed by greater issues; but, nevertheless, it should receive full consideration in any scheme to regulate the industry, particularly at present, when overproduction appears to be the major problem. Many big decisions are being made daily, and the principle of payment for quality should not be lost sight of even in a marketing crisis such as is threatening.

NOTES FOR THE HOME

Marmalade from Citrus Fruits

By RACHEL M. PEILE, Fruit Preserving Expert

As June, July, and August are the best months for marmalade making because of the large amounts of pectin and acid contained in citrus fruits during that period an assortment of this variety of preserve may now be made.

While there is quite a large variety of citrus fruits which are suitable for marmalade, the Rough Seville and the Smooth or Sweet Seville (Poorman), which are usually called jam oranges are the most popular, with grapefruit next in popularity. Many housewives prefer to use sweeter varieties such as the navel and Valencia because of the milder flavour, but the jam oranges will give a larger amount and also a slightly clearer product than the sweeter fruits because one quart of water is added to each pound of the jam oranges, and the white pith will become transparent in the boiling. On the other hand, the sweet varieties only take one pint of water to one pound of fruit and the white pith will not become clear during boiling. Lemons also make a very nice marmalade, but these are more often used in conjunction with other citrus fruits. Other varieties such as citrons, mandarins, limes, and cumquats all give a very good product.

Selection and Preparation of Fruit.

When selecting fruit for marmalade, it should be of an even colour and free from blemishes. It should be scrubbed to remove small particles of dust that lodge in the tiny pits in the skin. This is important, as mere washing will not remove these particles which sometimes cause cloudiness in the mixture. The general principles of jam making apply to marmalade making except that the peel of citrus fruits takes a much longer time to cook than the peel of softer fruits. For that reason more water has to be added to cook the peel. The white pith in citrus fruits should never be discarded as it contains the pectin. The acid is found in the juice and the bitterness lies in the tiny oil cells of the skin. If a milder flavoured marmalade is required the bitterness is drawn from the skin either by soaking it in cold water overnight or allowing it to stand for three or four hours in hot water before cooking. This also will help to slightly soften the peel. In both cases the water should be poured off before cooking and fresh water added.

Method of Making.

There are several methods of making marmalade, but the following directions should give a nice clear result:—

Cleanse the fruit, then weigh it and halve each orange, removing the centre core, which should be rejected as it does not "clear," but remains in thick white lumps. As it is much easier to shred the peel separately than slicing the whole orange, quarter the fruit and tear out the pulp, shred the skin very finely, using either a sharp knife or shredder, and allow it to soak overnight in cold water. Next day add the

Different Varieties of Citrus Fruit for Marmalade.

pulp, which has been finely cut, and the given quantity of water, using either the soaking water or discarding it. Most citrus fruits will take 1 quart of water to 1 pound of fruit, but sweet orange will take only 1 *pint* of water to 1 pound of fruit. Simmer the pulp and peels together until the peels are cooked. This takes about three-quarters of an hour. Then measure the mixture by cup and add an equal measure of sugar. After the sugar has dissolved boil the marmalade rapidly until it begins to rise up in the pan. Begin to test it at once, and when it falls from the spoon or rod in rough uneven flakes it should be boiled quickly for two or three minutes longer, then taken from the heat and allowed to stand for three or four minutes before bottling. If the marmalade is bottled at once the pieces of peel and pulp being lighter than the syrup immediately float to the top, leaving clear jelly at the bottom of the jar. This does not affect the flavour, but is unsightly in appearance. *The marmalade should be sealed when cold.*

For Exhibition Purposes.

When the marmalade is required for show purposes the pulp is cooked separately either by tying it in a piece of cheesecloth and placing it in the pan with the finely cut peels and water, or by cooking it separately in another pan, then when it has cooked sufficiently, straining it and adding the liquid to the rest of the juice and peels. Care should be taken to see that the given quantity of water is equally divided. The whole amount is then measured by cup and the necessary amount of sugar added. In this way the goodness is drawn from the pulp, but the finished product is a clear jelly with the peels evenly distributed throughout.

The Addition of Acid.

When using citrus fruits which have been left standing for over a week it is advisable to add a little acid to the raw fruit when it is cooking, as the acid in the fruit sometimes deteriorates. The quantities are 1 level teaspoon of tartaric or citric acid or 3 tablespoons of lemon juice to 2 lb. of raw fruit.

As it is often interesting to housewives to know the cost of certain recipes an approximate cost is given below of the marmalades made from four different varieties of citrus fruit. It must be remembered, however, that the prices of fruits fluctuate, and furthermore that the costs will differ according to the methods of heating used.

Grapefruit.

	s.	*d.*
4 grapefruit (2 lb. approximately) at 3d. each	1	0
3 lb. sugar at 4d. per lb.	1	0
Heating	0	2
2 quarts water	—	
4 1-lb. jars	2	2

Seville or Poorman Orange.

	s.	*d.*
5 oranges (2 lb. approximately) at 2d. each	0	10
3 lb. sugar at 4d. per lb.	1	0
Heating	0	2
2 quarts water	—	
4 1-lb., jars	2	0

Sweet Orange.

	s.	*d.*
5 oranges (2 lb.) at 2d. each	0	10
3 lb. sugar	1	0
Heating	0	2
2 pints water	—	
3 1-lb. jars	2	0

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Issued by direction of the Hon. E. J. Hogan, M.L.A., Minister of Agriculture.

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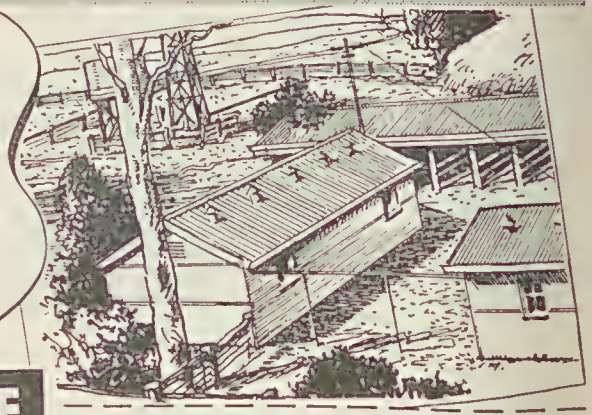

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The Journal of the DEPARTMENT of AGRICULTURE of VICTORIA

Journal of Agriculture, Victoria—August, 1941.

SOIL DRIFT CONTROL

Results of Competition

Report of the Judge, H. L. HORE, B.Agr.Sc.,
Inspector of Agriculture and Member of the Soil Conservation Board

WITH the object of surveying the methods being used by farmers to control soil drift in the Mallee, and to publicize those methods found most successful in minimizing the evil, a competition was inaugurated last year by Mr. Commissioner Hanslow of the State Rivers and Water Supply Commission for the best effort to control soil drift on a Mallee farm.

The main condition of the competition was that it should be judged by the efforts made and the degree of success achieved, in reducing soil drift on the cultivated areas farmed by the entrants, and also in relation to their general farm management and economy. Consideration was given to the problems faced by each of the entrants, in an endeavour to assess the degree of difficulty with which he had to contend in reducing the amount of drift.

Causes of Soil Drift.

There are several reasons why soil drift is more extensive in the Mallee than elsewhere. It is the lowest rainfall district of the State; long periods of dry weather are experienced over the summer months, during which time winds of high velocity are common; the topography of the land is undulating, and the soils, which are in general of a sandy nature, have low cohesive properties and blow readily when exposed to the wind.

The heaviest yielding wheat crops are those grown on land which in the previous year has been bare-fallowed in preparation for the crop, and this practice is widely adopted. Also the development and maintenance of pasture on land left out for grazing is a difficult matter. In a dry season particularly, the soil is readily denuded of vegetative covering and left exposed to the wind.

Control Methods.

Although they play a big part in the matter of soil drift, the climate and soil of the Mallee are fixed natural features. It is to farming methods and practices therefore to which we must turn our attention in efforts to minimize drift.

Although crops grown on land which has been normally bare-fallowed produce the heaviest yields, modifications of this practice on light land, which drifts readily, are desirable in order to reduce drift and prevent the deterioration of the soil over a period of years. Where it is possible to retain sufficient straw or other trash on or near the surface of the fallowed land, it will assist very materially in reducing the amount of soil drift.

Frequent cultivation of the fallow before early autumn, and dry working, are undesirable in that they accelerate the natural tendency for the soil to become fine and

Left.—Fallow prepared by scarifying in July and ploughing later (Oct.) to leave rough surface. Drift was markedly reduced. Right.—Normal fallow showing large patches blown bare of mulch.

powdery. However, when rains are received in the autumn no opportunity to work the land should be neglected. It is at this time of the year that most of the soil drift takes place, and the ridges left by cultivation materially retard the movement of the soil, moisture is conserved for the subsequent crops, weed seedlings are destroyed, and the land is left in good condition for seeding.

On very drifty land, late fallowing frequently will result in less drift. The initial ploughing or cultivation of these areas may be delayed until the spring, or even autumn, depending on the liability to drift, but in order that yields will not be too seriously affected, weeds and other rubbish growing on such late fallowed areas should be kept well under control by judicious grazing with sheep.

As an alternative to late fallowing of light land, such areas could be sown in the winter with a cereal crop, preferably oats or ryecorn, grazed until the autumn, and then cultivated in readiness for the wheat crop. It should be understood, however, that if the crop for grazing is fed off too severely, the land will drift just as badly as does normal fallow.

A Mallee channel filled with drift sand from a fallow paddock.

In tests at the Mallee Research Station at Walpeup, cover-crop fallows have been found to be very effective in controlling drift. This practice involves sowing a cereal crop, in the spring on land which has been fallowed and treated in the normal manner up to this time. The crop, sown in the spring, is grazed down after the plants have become firmly established, and provided sufficient roots and stalks are left to hold the soil over the summer months, this treatment offers one of the most effective

means of controlling drift on fallowed land. Its chief disadvantage is that, in drought years, there may not be sufficient rain to ensure germination and growth of the cover crop.

The above modifications of normal cultivation practices have been shown by experiments to result in a slightly lower yield of the following wheat crop grown on the area, but this is offset to some extent at least by the value of the extra feed available for sheep. In addition, the soil is conserved for future years.

Fodder reserves on the property of Mr. A. H. Schack, Gama.
[*Leader* photo.

It is the usual practice on a Mallee farm to apply the same cultivation treatment to the whole of the paddock, irrespective of the hills and flats within its boundaries. While this procedure has the obvious advantage of convenience in working, better results from the erosion control point of view would be achieved by normally fallowing those parts which do not drift readily, and paying particular attention, on the lines indicated above, to those parts where the tendency to drift is more pronounced. Drifty areas near roads, railways, and water supply channels, where the costs for removal of sand are likely to be far greater than the benefits derived from fallowing, should not be fallowed at all.

Grazed stubble of cover crop preventing soil from drifting on a sandy rise in the Mallee.

A sand hill badly scoured by wind action. [*Weekly Times* photo.

The rotational practice adopted on the farm also has a bearing on the amount of soil drift which takes place. A long rotation, if the area of the farm permits, involves less land under cultivation and hence in a condition to drift readily. Longer rotations, which include a period of a few years when the land is left out to grass, may also assist in consolidating the ground, and the grass roots will tend to hold the soil in a sod when it is again ploughed.

Drift control methods on land left out of cultivation must aim at the establishment and maintenance of some form of vegetation over the area. In recent years at the Mallee Research Station at Walpeup, increased attention has been devoted to pasture investigation, and this work may eventually be of considerable importance in connexion with soil-drift control. Droughts and over-grazing are the two features most responsible for denuding land of grass and other herbage. Once the land does become bare it is imperative that some steps be taken if soil drift is to be checked. This applies particularly to the sandhills. Under these circumstances it is recommended that, if possible, the land be cultivated in the autumn, and sown with a cereal crop for light grazing. The choice of the cereal to be sown would no doubt be governed by the availability and cost of the seed. However, the value of rye-corn for this purpose should not be overlooked. Rye-corn has been found to be the most suitable cereal for growing on loose sand banks or hills depleted of surface soil and fertility by wind erosion. Its value in this direction warrants its greater use in the Mallee.

The best results in the control of soil drift can be achieved only when the whole of the farming operations are conducted with a view to protecting the soil from the action of the wind. It is realized, however, that the extent to which Mallee farmers adopt erosion control measures is governed in a large degree by their financial position, and their security of tenure on the land. In the absence of security of tenure there is little incentive for farmers to adopt practices that will lower their immediate incomes, even though such practices would return greater incomes over a period of years.

The Competition.

The competition attracted eighteen entries representing Mallee districts from Swan Hill to the South Australian border, and from Rainbow to Ouyen. The fact that a drought was experienced last year increased the difficulty of all competitors in the satisfactory application of control measures.

Among the competitors the most commonly practised method of reducing drift was to refrain from burning wheat stubbles on land which was to be either fallowed or sown to oats. When oats are to be sown on stubble land, the presence of a large amount of stubble may necessitate burning or thinning out if a combine is to be used for seeding. In such cases the burning should be left as late as is practicable, as the period between the time of burning and the covering of the ground by the oat crop is one when the land is very susceptible to drift. Many of the competitors stress the value of a disc drill or sunderseeder when sowing oats on stubble, as these implements will cope with considerable quantities of straw, which is left to protect the young crop, during its early stages of growth, from the cutting action of flying sand. Two of the competitors preferred to sow all oats on fallow land, leaving stubble areas out to grass. This method gives a greater degree of certainty of obtaining a good cut of hay, and when wheaten stubble land is fallowed after one or two years out to grass there is usually sufficient straw remaining on the area to be of value in holding the soil.

Late fallowing of sandhills was also a feature commonly practised by the majority of competitors, some of whom deliberately delay ploughing until such time as sufficient rubbish grows to be of value as a trash cover.

The farms inspected ranged in area from 630 acres to 3,085 acres, and the total area of all the farms entered for the competition exceeded 30,000 acres. In judging the competition two inspections were made, the first in early November to see the condition of the land and methods employed as control measures, and the second for the final judging at the end of April to determine how effective the control measures had proved to be during the summer and autumn months.

Awards and Comments.

The competition was won by Mr. F. A. Meagher, of Carina. Second place went to Mr. G. S. Staples of Rainbow and third to Mr. A. H. Schack of Gama.

Mr. Meagher's property is located about 2 miles north-west of Carina township, and comprises an area of 1,890 acres. The soil is sandy undulating country with a retentive subsoil under the sand. Practically the whole of the farm is cultivable, and as wool production is an important part of the farming activities, it is subdivided into fourteen paddocks, and fences are kept in good repair.

The rotation adopted by Mr. Meagher is one which should do much to maintain and build up the fertility of the soil. Wheat is seldom sown on the same paddock more often than once in five years. After being in wheat each paddock is either left out to grass for a period of years or sown with a cereal crop for hay, grain, or grazing. The cereals sown for grazing are barley, oats, or rye, and frequently barley and rye, or oats and rye are mixed before sowing for this purpose. Mr. Meagher contends that mixed cereals provide a better succession of feed than when sown individually.

In recent years the average area sown to wheat on this property has been approximately 300 acres, while that sown with other cereals sometimes reaches as much as 1,000 acres per annum. From this area the necessary hay and grain requirements for fodder conservation and seed purposes are obtained, but by far the greater proportion of the property is used for grazing. When sowing wheat, 93 lb. per acre of superphosphate is sown with the seed, and on all other cereals, irrespective of the purpose for which they are required, superphosphate is applied at the rate of one bag to 4 acres. It is very doubtful if the increased growth obtained by the use of superphosphate on stubble crops is sufficient to warrant its

The top of a sand hill may be blown off and the loose sand deposited in a dune-like formation.

Oats sown with a disc drill on wheaten stubble land. The stubble provides protection for the young crop. [*Weekly Times* photo.

application. However, Mr. Meagher contends that the continued application of this fertilizer builds up the fertility of the soil, and the prolific growth and natural spread of barrel medic on part of this property lends considerable weight to his argument.

Mr. Meagher does not adhere rigorously to a fixed rotation in each paddock. The treatment it receives is governed very largely by the condition of the paddock as regards natural cover. Each year part of the wheat crop is sown on fallow, and part on land which is worked up in the autumn after carrying a cereal crop for grazing in the preceding year. No wheat stubbles are burned, nor have any been burned during the past ten years. Following the wheat crop the stubble is either left out to grass or sown for grazing, depending on the necessity of producing extra feed. When sowing stubble land a disc drill is used. Grassland may, if the cover is poor, be cultivated and sown with a crop for grazing.

It is contended by Mr. Meagher that both the quality and quantity of the feed which develops on land left out to grass deteriorates with each succeeding year, and it is not desirable to leave areas out to grass for a period exceeding three years.

The areas prepared for sowing to wheat this year are typical examples of the rotations used.

Paddock I (200 acres)—
- 1936—wheat.
- 1937—oats cut for hay.
- 1938—oats for grazing purposes.
- 1939—grass.
- 1940—rye-corn and barley for grazing purposes.
- 1941—cultivated in January, and to be sown to wheat.

Paddock K (100 acres)—
- 1936—oats.
- 1937, 1938, 1939,—grass.
- 1940—fallow.
- 1941—wheat.

Paddocks to be fallowed are, as far as possible, left out to grass for at least one year, and after heavy grazing in the winter are late fallowed with a mouldboard plough, and sheeped but not further cultivated until the autumn.

The Carina district was unfortunate in that it has experienced two droughts in succession. Both 1939 and 1940 were very lean years in this district. Under these conditions it is inevitable that some blown patches will appear. A method of dealing with blown patches is to be seen on this property. The metho

Sand hill denuded of top soil to a depth of several feet.

consists of cultivating the areas from which the topsoil has been removed by wind action, and sowing them with rye-corn. This is fenced off and allowed to seed before being grazed. That this method will succeed in re-establishing cover on wind-swept areas is well demonstrated on this farm.

Mr. Meagher uses both a tractor and horses for his cultivating operations, and carries a flock of approximately 1,000 pure-bred Merino sheep on this property. The quality of this flock has been built up by careful selection and culling, and the sheep are an exceptionally fine line of which he is justifiably proud. By the steps taken to ensure plenty of feed for the flock, it is usually possible to dispose of all wether lambs as fats.

A well-ridged cultivation paddock on the property of Mr. G. S. Staples, Rainbow. [*Leader* photo.

Mr. G. S. Staples's property of 630 acres is located about 4 miles south-west of Rainbow, and is good Mallee land. Mr. Staples views the drift problem very seriously, and like Mr. Meagher, conducts all farming operations with the object of minimizing the trouble as much as possible. Areas on the farm necessitating special erosion control measures are treated differently from those where the risk of erosion is not so great.

The special precautions taken with fallowing operations play an important part in the success achieved in controlling drift on this farm. Those areas in any particular paddock most likely to drift, are not fallowed with the rest of the paddock, irrespective of the size or shape of such areas. Mr. Staples contends that if fallowed these parts not only erode badly, but act as focal points, and the drift from them causes other more stable parts of the fallow to drift. Sheep have access to the paddock, and serve to keep weeds under control on both the fallowed and non-fallow areas. When rain is received in the late autumn or early winter, the non-fallow areas are cultivated and sown to either barley or oats at the normal seeding time. The remainder of the paddock, which is fallowed, is sown to wheat.

Following this crop the stubbles are grazed, and if sufficient rain is received the heavier parts of the paddock are ploughed in October. The lighter areas are not then ploughed, but, if possible, cultivated in the autumn, and the whole area is sown to oats in the next season. After this oat crop the land is allowed to go out to grass, and in the sixth year the heavier portions are again fallowed, and the lighter parts prepared for oats or barley as described above.

Mr. Staples does not hesitate to vary this rotation if circumstances make such a change desirable. During the first inspection in November it was observed that one paddock, which had been sown to oats in 1939, had, owing to the drought last year, failed to develop a cover of grass, and looked as though it would drift badly. However, rain was received in late December, so, instead of letting the paddock take a chance, it was all cultivated. This was worked again later, and at the time of the second inspection was in excellent condition for seeding to a cereal crop. When sandy land is cultivated in the autumn every effort is made to keep it ridged, even if this involves working the land two or three times in the short period between the autumn cultivation and seeding. Mr. Staples has not burned any stubbles since 1922. The whole of the operations on the farm appeared

The roughing up of blown patches on fallow, as illustrated, catches the sand, and retards drift. [*Leader* photo.

to be particularly well conducted, and despite the season, drift had been reduced to negligible proportions. In addition to the cropping operations, a flock of approximately 170 cross-bred ewes are carried on the property.

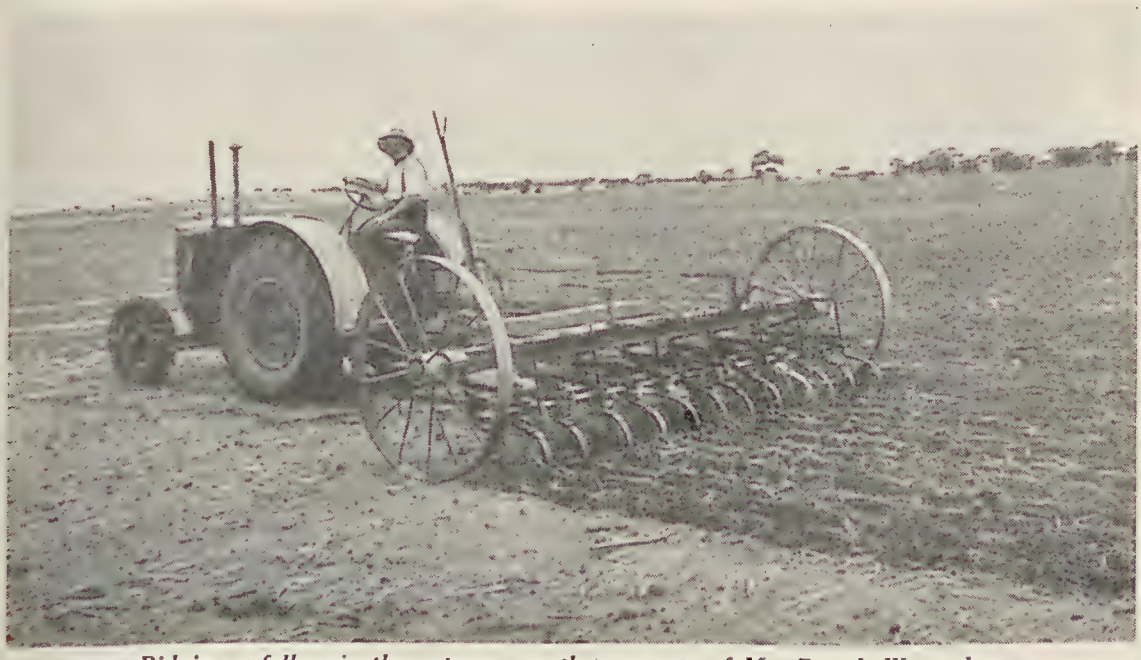
Mr. A. H. Schack, who gained third place in the competition, farms a property of 1,045 acres at Gama, and in addition has 200 acres of fallow and 200 acres of wheat each year on the share system on a nearby property. Much of the land is light Mallee country, and drifts very readily if not handled carefully.

One of the features of Mr. Schack's drift control methods is the strenuous effort made to stop small wind-blown patches from extending. The whole property is carefully watched, and immediately a patch from which the surface soil has blown is located, it is covered with branches, straw, stable manure or any available rubbish. By this means the eroding power of the wind is minimized, and instead of the scour enlarging it catches drifting soil and is healed. The process of healing is assisted by scattering seeds over the rubbish. The labour and attention which this method involves is more than many farmers would be prepared to give to it, but that it can be effective is well demonstrated on this property.

Mr. Schack usually sows all wheat on fallowed land, and oats or barley on stubble. Approximately 300 to 350 acres are sown to wheat on the home block each year. If fodder reserves are low, a sufficient area of oats is sown on fallow to ensure that adequate supplies of fodder are built up. Hand feeding of sheep is resorted to when necessary in an endeavour to prevent feed paddocks from being eaten out too much. One large paddock shown by Mr. Schack carried a good sprinkling of Wimmera rye grass, obtained by sowing a few pounds of rye grass seed as the paddock was being sown to oats in 1938.

The usual method of fallowing is to plough the flats and heavier parts in July leaving the hills until the spring or autumn. When fallowed in the spring, the tops of hills are not worked until after the summer, unless they start drifting. In one fallow paddock the crest of a sandhill which had commenced to drift had been roughed up with a plough. The rough cloddy surface thus obtained was catching drift sand nicely at the time of the final judging, and at seeding time would provide quite a good seedbed for the wheat. It is very important to make every endeavour to get a good germination of crop on blown patches on sandhills, particularly when the land is to be left out to grass. Otherwise, without anything to bind them the scours develop, and the whole of the hill may be stripped of topsoil in a few years.

Mr. Shack also intensively practises a form of modified listering or ridging. After showers of rain which do not provide sufficient moisture for a general cultivation, those portions of the fallow which have flattened and commenced to "run" are again ridged up. With a cultivator and tractor many such areas can be treated in a short time, while the ground is still moist enough for cultivation. This work is, of course, carried out only in the late summer and autumn months. Oats are sometimes sown on stubble land for grazing by sheep. If, after grazing, this land commences to drift Mr. Schack recommends working it over with a heavy plough on which every second foot is lifted. The ridges and clods produced in this way will prevent further drifting for some time. A flock of approximately 300 breeding ewes is maintained on this property.



Ridging a fallow in the autumn, on the property of Mr. Broad, Woomelang.
[*Weekly Times* photo.

Mr. H. G. Broad demonstrated some very good drift control work on his father's property at Woomelang. Wheat growing is the main activity on this farm, and from one-third to half of the farm is sown to wheat each year. Some of the paddocks are worked on a three-course rotation of wheat-oats-fallow, while others are in a two-course rotation, wheat-fallow. Heavy-yielding wheat crops are grown, and the stubbles are not burned. In the case of the three-course rotation the oats are disced in on the stubble, and it is found that there is sufficient stubble left on the ground in the next year to act as a protection for the fallow against drift. Where the two-course rotation is used on relatively heavy land, heavy stubbles are thinned out with a fire rake on a cold day if necessary, before fallowing, so that ordinary farming implements will handle the straw without difficulty. On lighter land stubbles are not thinned, and disc implements are used for cultivation. If necessary, excess straw on the fallow is burned in March or April so that no blocks will occur when combining in the crop.

A number of the other competitors had also made determined efforts to reduce soil drift on their properties, and their failure to obtain leading places in the competition does not in any way detract from the merits of the work they are doing.

It is proposed to hold another Soil Drift Control Competition this season. No entrance fee is required, and prize money has been considerably augmented. By participating in this competition, and demonstrating on his own farm the methods he considers most suitable and practicable for controlling soil drift, a farmer may be doing a benefit not only to himself, but to the whole of the State, and particularly to the Mallee.

Phenothiazine Treatment Against Worms

Valuable New Drug

PHENOTHIAZINE (*thiodiphenylamine*) is a yellowish powder, insoluble in water. When marketed for use against worm parasites it usually has added to it a wetting or spreading agent, sometimes referred to as a "conditioner," which enables it to be mixed with water to form a suspension suitable for drenching. There are many varieties of wetting agents, and their nature may change the appearance of phenothiazine. The amounts of such materials mixed with phenothiazine usually do not exceed 5 to 10 per cent.

Phenothiazine was tested in the United States of America as an insecticide for the control of codling moth. Further work there showed that the drug, when fed to cattle, prevented the development of horn-fly larvae in their droppings. Subsequent investigations in the United States of America, Australia, Canada, and England have shown that phenothiazine is very efficient against many of the more important worm parasites of domestic animals.

At the present time the drug is expensive and supplies are limited. It should, therefore, be used against those parasites which are causing greatest economic losses, and which cannot be effectively controlled by other methods of treatment.

In Australia the sheep is of chief economic importance, and suffers from infestation by a number of different worm parasites. The Nodule Worm (*Oesophagostomum columbianum*) is one of the most important of these, and phenothiazine is the only drug which, given as a drench, is effective against this parasite.

Present costs and supplies are such that the drug should be used almost solely for the control of the nodule worm.

In the following paragraphs the present knowledge of the efficiency of phenothiazine against worm parasites of domestic animals is briefly outlined. Dose rates, which in many cases are still not conclusively fixed, are also given.

Sheep.

With sheep phenothiazine is very efficien for treatment against large Stomach Worm o Barber's Pole Worm (*Haemonchus*), Nodul Worm (*Oesophagostomum columbianum*) Small Intestinal Worm or Black Scour Worn (*Trichostrongylus*), and Small Brown Stomacl Worm or Hair Worm (*Ostertagia*). It is not effective against Liver Fluke or Tapeworms.

The present recommendations for doses are grown sheep, $\frac{1}{2}$ oz. (25 grammes); young sheep 8-12 months, $\frac{1}{2}$ oz. (15 grammes); weaners, 4-8 months, $\frac{1}{3}$ oz. (10 grammes). Sheep should not be starved before or after treatment.

Phenothiazine can be given in capsules or in tablet form, but for general flock treatment drenching is the most satisfactory method. Phenothiazine is marketed as a powder, and this by virtue of an added wetting agent mixes with water to form a suspension which can be administered from drenching funnels. It has been found that a suspension which is sufficiently thin to flow readily from a drenching funnel cannot be administered satisfactorily through drenching syringes or guns owing to jamming of valves and pistons. However, a thicker suspension, too thick to flow readily from a drenching funnel, can be administered from drenching syringes, particularly those having leather or rubber plungers, provided they are frequently oiled and thoroughly cleaned. Automatic drenching guns still present obstacles to satisfactory use with the phenothiazine suspension, but by modifying the valve mechanism it will probably be possible to utilize these instruments.

In preparing phenothiazine for drenching, it is advisable to pass the suspension through a fine sieve before beginning administration (a kitchen flour sifter is useful for this purpose). Should any lumps remain in the suspension they will settle out, thus leading to inaccuracies in dose rate, or, if drenching syringes are used, are likely to clog the valves and piston.

* Statement issued by the Council for Scientific and Industrial Research.

When suspensions are made according to directions given by firms marketing phenothiazine, they must be stirred constantly during drenching, for they have a tendency to settle out. If this is permitted, dose rates will be inaccurate. When thicker suspensions are made for use with drenching syringes, the settling out effect is greatly reduced.

There are two preparations containing phenothiazine on the market in Australia at present. These are sold as "Phenovis" and "Phenzeen." It was found that by mixing 1 lb. of either of these preparations with 16 fl. oz. water a suspension suitable for use with drenching syringes was formed. Of these suspensions a dose of 1½ oz. (approximately 45 c.c.) contains 25 grammes of phenothiazine, i.e., the dose for a grown sheep. For young sheep 8 to 12 months old use 1 fl. oz. (30 c.c.), and for weaners 4 to 8 months use ⅔ fl. oz. (18-20 c.c.).

Cattle.

For cattle, phenothiazine is effective against Large Stomach Worm (*Haemonchus*), Small Brown Stomach Worm (*Ostertagia*), Hookworm (*Bunostomum*), Small Intestinal Worm (*Trichostrongylus*), and Nodule Worm (*Bosicola radiatum*). It is not effective against Tapeworms (*Moniezia*).

The dose rate for cattle is not finally decided upon, and as cattle (particularly young, worm-infested calves) are much less tolerant than sheep of large doses, the drug should be used with caution. For calves up to 6 months old the dose should not exceed 1 oz. (30 gms.), and for cattle 6 to 18 months old should not exceed 2 oz.

Horses.

With horses, phenothiazine is very effective against Redworms (*Strongyles*), and is quite satisfactory for treatment against Large Roundworms (*Ascaris*). It is not effective against Tapeworms or Bots (*Gastrophilus*).

Phenothiazine is not as safe for use in horses as in sheep, and large doses should not be given. Horses in very poor condition are especially susceptible to toxic effects, and for such animals the dose should be reduced to half that which would normally be used.

The dose rates suggested are:—

Large draughts	2 oz.
Light to medium draughts	1½ oz.
Thoroughbreds	1 oz.
Ponies	½ to ¾ oz.

The drug can be most conveniently given mixed with the feed. Liberal quantities of bran should be given before and after its use in order to overcome its constipating effects. It may be necessary to starve horses for 12 to 16 hours in order to make them eat feed containing the phenothiazine, but for most horses this is not necessary.

Pigs.

Phenothiazine is very effective against Large Round Worms (*Ascaris*) and Nodular Worms (*Oesaphagostomum*) in pigs.

It can be given in the feed, in capsules or tablets. The dose rates are:—

For pigs weighing 25 lb., 5 gms. (about ⅙ oz.).

For pigs weighing 25-50 lb., 8 gms. (about ¼ oz.).

For pigs weighing 50-100 lb., 12 gms. (about ½ oz.).

For pigs weighing 100-200 lb., 20 gms. (about ¾ oz.).

For pigs weighing over 200 lb., 30 gms. (about 1 oz.).

Pigs should be starved for 18 to 24 hours before treatment.

If phenothiazine is to be administered in the feed, pigs should be confined in a pen with which they are familiar. If a group of pigs is to be treated at one time, sufficient space should be provided at the trough for all animals. Pigs varying greatly in size should not be treated in one lot, and phenothiazine should be offered only when the pigs are sufficiently hungry to consume the phenothiazine and feed mixture at once. The drug should be mixed with three to four times its weight of dry ground feed. If the animals are accustomed to feeding on slops the medicated mixture may be made into a thick mass. Feeding in thin slops should be avoided.

Poultry.

Phenothiazine is effective against the Caecal Worm (*Heverakis*), and moderately effective against the Large Round Worm (*Ascaridia*). It is not effective against other poultry parasites, including tapeworms and coccidia.

The dose rate is from 0.05 to 0.5 gramme per bird, depending on size, or from 5 grammes (⅙ oz.) to 50 grammes (1⅔ oz.) per 100 birds.

Phenothiazine Treatment Against Worms*

Valuable New Drug

PHENOTHIAZINE (*thiodiphenylamine*) is a yellowish powder, insoluble in water. When marketed for use against worm parasites it usually has added to it a wetting or spreading agent, sometimes referred to as a "conditioner," which enables it to be mixed with water to form a suspension suitable for drenching. There are many varieties of wetting agents, and their nature may change the appearance of phenothiazine. The amounts of such materials mixed with phenothiazine usually do not exceed 5 to 10 per cent.

Phenothiazine was tested in the United States of America as an insecticide for the control of codling moth. Further work there showed that the drug, when fed to cattle, prevented the development of horn-fly larvae in their droppings. Subsequent investigations in the United States of America, Australia, Canada, and England have shown that phenothiazine is very efficient against many of the more important worm parasites of domestic animals.

At the present time the drug is expensive and supplies are limited. It should, therefore, be used against those parasites which are causing greatest economic losses, and which cannot be effectively controlled by other methods of treatment.

In Australia the sheep is of chief economic importance, and suffers from infestation by a number of different worm parasites. The Nodule Worm (*Oesophagostomum columbianum*) is one of the most important of these, and phenothiazine is the only drug which, given as a drench, is effective against this parasite.

Present costs and supplies are such that the drug should be used almost solely for the control of the nodule worm.

In the following paragraphs the present knowledge of the efficiency of phenothiazine against worm parasites of domestic animals is briefly outlined. Dose rates, which in many cases are still not conclusively fixed, are also given.

Sheep.

With sheep phenothiazine is very efficient for treatment against large Stomach Worm or Barber's Pole Worm (*Haemonchus*), Nodule Worm (*Oesophagostomum columbianum*), Small Intestinal Worm or Black Scour Worm (*Trichostrongylus*), and Small Brown Stomach Worm or Hair Worm (*Ostertagia*). It is not effective against Liver Fluke or Tapeworms.

The present recommendations for doses are: grown sheep, ¼ oz. (25 grammes); young sheep, 8-12 months, ½ oz. (15 grammes); weaners, 4-8 months, ⅓ oz. (10 grammes). Sheep should not be starved before or after treatment.

Phenothiazine can be given in capsules or in tablet form, but for general flock treatment drenching is the most satisfactory method. Phenothiazine is marketed as a powder, and this by virtue of an added wetting agent mixes with water to form a suspension which can be administered from drenching funnels. It has been found that a suspension which is sufficiently thin to flow readily from a drenching funnel cannot be administered satisfactorily through drenching syringes or guns owing to jamming of valves and pistons. However, a thicker suspension, too thick to flow readily from a drenching funnel, can be administered from drenching syringes, particularly those having leather or rubber plungers, provided they are frequently oiled and thoroughly cleaned. Automatic drenching guns still present obstacles to satisfactory use with the phenothiazine suspension, but by modifying the valve mechanism it will probably be possible to utilize these instruments.

In preparing phenothiazine for drenching, it is advisable to pass the suspension through a fine sieve before beginning administration (a kitchen flour sifter is useful for this purpose). Should any lumps remain in the suspension they will settle out, thus leading to inaccuracies in dose rate, or, if drenching syringes are used, are likely to clog the valves and piston.

* Statement issued by the Council for Scientific and Industrial Research.

When suspensions are made according to directions given by firms marketing phenothiazine, they must be stirred constantly during drenching, for they have a tendency to settle out. If this is permitted, dose rates will be inaccurate. When thicker suspensions are made for use with drenching syringes, the settling out effect is greatly reduced.

There are two preparations containing phenothiazine on the market in Australia at present. These are sold as "Phenovis" and "Phenzeen." It was found that by mixing 1 lb. of either of these preparations with 16 fl. oz. water a suspension suitable for use with drenching syringes was formed. Of these suspensions a dose of 1½ oz. (approximately 45 c.c.) contains 25 grammes of phenothiazine, i.e., the dose for a grown sheep. For young sheep 8 to 12 months old use 1 fl. oz. (30 c.c.), and for weaners 4 to 8 months use ⅔ fl. oz. (18-20 c.c.).

Cattle.

For cattle, phenothiazine is effective against Large Stomach Worm (*Haemonchus*), Small Brown Stomach Worm (*Ostertagia*), Hookworm (*Bunostomum*), Small Intestinal Worm (*Trichostrongylus*), and Nodule Worm (*Bosicola radiatum*). It is not effective against Tapeworms (*Moniezia*).

The dose rate for cattle is not finally decided upon, and as cattle (particularly young, worm-infested calves) are much less tolerant than sheep of large doses, the drug should be used with caution. For calves up to 6 months old the dose should not exceed 1 oz. (30 gms.), and for cattle 6 to 18 months old should not exceed 2 oz.

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The dose rates suggested are:—

Large draughts	2 oz.
Light to medium draughts	1½ oz.
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The drug can be most conveniently given mixed with the feed. Liberal quantities of bran should be given before and after its use in order to overcome its constipating effects. It may be necessary to starve horses for 12 to 16 hours in order to make them eat feed containing the phenothiazine, but for most horses this is not necessary.

Pigs.

Phenothiazine is very effective against Large Round Worms (*Ascaris*) and Nodular Worms (*Oesaphagostomum*) in pigs.

It can be given in the feed, in capsules or tablets. The dose rates are:—

For pigs weighing 25 lb., 5 gms. (about ⅙ oz.).

For pigs weighing 25-50 lb., 8 gms. (about ¼ oz.).

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For pigs weighing over 200 lb., 30 gms. (about 1 oz.).

Pigs should be starved for 18 to 24 hours before treatment.

If phenothiazine is to be administered in the feed, pigs should be confined in a pen with which they are familiar. If a group of pigs is to be treated at one time, sufficient space should be provided at the trough for all animals. Pigs varying greatly in size should not be treated in one lot, and phenothiazine should be offered only when the pigs are sufficiently hungry to consume the phenothiazine and feed mixture at once. The drug should be mixed with three to four times its weight of dry ground feed. If the animals are accustomed to feeding on slops the medicated mixture may be made into a thick mass. Feeding in thin slops should be avoided.

Poultry.

Phenothiazine is effective against the Caecal Worm (*Heverakis*), and moderately effective against the Large Round Worm (*Ascaridia*). It is not effective against other poultry parasites, including tapeworms and coccidia.

The dose rate is from 0.05 to 0.5 gramme per bird, depending on size, or from 5 grammes (⅙ oz.) to 50 grammes (1⅔ oz.) per 100 birds.

It is probable that these dose rates can be exceeded with safety, and will then yield greater efficiency against the Large Roundworm.

Phenothiazine can be administered to poultry in capsules, or mixed with the feed.

Dogs.

Phenothiazine has not shown satisfactory effects against any of the worm parasites of dogs.

Effects of Phenothiazine on Animals.

Part of the phenothiazine is absorbed and excreted by the kidneys and gives the urine a reddish-brown colour. The passage of coloured urine continues for four or five days after administration of the drug. The urine will stain the wool of sheep, but under general conditions in the field this is not of sufficient significance to be a contra-indication for the use of the drug. When treating sheep, however, some precautions should be taken to minimize staining. During drenching great care should be taken to avoid spilling phenothiazine on the wool. Immediately after drenching, sheep should be allowed to go into a large yard. If sheep are crowded together, they are likely to rub phenothiazine from their mouths on to the rumps of other sheep. Urine will be stained red within an hour or two of drenching and, particularly in the case of ewes, is likely to be passed against the sides of other sheep, and, further, should sheep lie down on ground on which coloured urine has recently been passed, they are likely to have their belly wool stained. It is, therefore, desirable to allow sheep to go back to their paddock as soon after drenching as possible and to avoid holding or droving them during the next few days.

Phenothiazine is very "safe" and rarely produces ill-effects. As already stated, horses and cattle appear to be more likely to suffer ill-effects than other animals. It is, therefore, unwise to give them large doses, particularly if in poor condition.

Tubercle Free Herds

The following herds have been declared free of tuberculosis under the scheme conducted by the Department of Agriculture. Under this scheme a tuberculosis-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests, or upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

ACCREDITED TUBERCLE FREE HERDS.

Name.	Address.	Number in Herd.	Name.	Address.	Number in Herd.
Ballarat Mental Hosp...	Ballarat	78	Onley, W. H. ..	"Glenholme," Caldermeade	67
Banyule Stud Pty. Ltd.	Heidelberg	34	Payne, A. E. T. ..	"Yarra View," Lilydale	77
Dennis, Mrs. A. A. ..	Frankston	19	Payne, T. E. N. ..	"Woodburn," Kilmore	58
Dookie Agricultural College	Dookie	78	Powell, T. S. ..	"Carellen," Mansfield	41
Dunbar and Clark, Messrs.	"Hazeldean Dairy," Mount Dandenong	15	Reid, Ralph G. ..	"Holmwood," Koowee-rup	78
Geelong Grammar School	Corio	58	Richardson Bros., Messrs.	"Faldinghurst," Upper Beaconsfield ..	30
Gorman, A. W. ..	"Cathcart," Alexandra	80	Samuel, B. T. ..	Lang Lang ..	60
Henderson, J. L. and E. I.	Wangaratta ..	95	School of Horticulture..	Burnley	6
Holloway, R. W. ..	Caldermeade ..	56	State Experiment Farm	Rutherglen ..	51
Lawrence, P. H. ..	"Rainga," Tarrawarra	60	State Research Farm ..	Werribee	211
Longerenong Agricultural College	Dooen	46			

In addition to the above-mentioned herds there are 115 commercial dairy herds containing 3,795 head of cattle which may be considered free of tuberculosis. All these herds have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds, they cannot be considered as accredited under the accreditation scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

There are also 84 herds in which 4,495 head of cattle have passed one test, and may be considered, therefore, to be in process of becoming tuberculosis-free herds.

Meat Export Trade

A Review by the Chairman of the Australian Meat Board, Mr. A. C. Fisken.

SEVERAL days after the outbreak of war the Australian High Commissioner in London cabled that "the United Kingdom Government have advised me that they are prepared to purchase the exportable surplus for twelve months of frozen beef, mutton, lamb, pork of 120–180 lb. weight, and edible offals as at present shipped." This offer was accepted by Australia, and after prolonged discussions an agreement was eventually negotiated between the two countries whereby the United Kingdom Government undertook to purchase a basic quantity of 240,000 tons of all classes of meat. A further provision of the contract was to the effect that if more meat were available and required by the United Kingdom, and if shipping were available to lift such extra quantity it, too, would be purchased.

Generally speaking seasonal conditions were favorable during the period under review and the amount available for export was 294,000 tons. Up to the end of July, 1940, shipments, which by then aggregated 230,000 tons, moved out regularly and there was no abnormal accumulation of meat in cold stores. However, at the end of July a notification was received from the United Kingdom through the High Commissioner that the total quantity that could be lifted up to the end of September was 260,000 tons. As supplies in sight were greatly in excess of this quantity and as it was desired to have cold stores as free as possible to cope with the new lamb season's production, restrictions were placed upon the receipt into store of various cheaper classes of meat. The restricted classes were as follow:—

All ewe mutton other than maiden ewe mutton.
All third quality wether and/or maiden ewe mutton.
All mutton cuts.
All third quality cow beef.
All bull beef.
All veal.
All pork cuts other than ordinary sides or Wiltshire sides.

Even with these restrictions the quantity of 34,000 tons which was in store at the end of September was abnormally large.

As early as July negotiations were again commenced for a further contract for the period October, 1940, to September, 1941. The Commonwealth endeavoured to secure a basic quantity of 290,000 tons, but eventually the figure of 249,000 was agreed upon with special provision within this figure for 24,000 tons of baconer pork.

On the 4th January a cable was received from the High Commissioner in London saying that, owing to a deterioration in the shipping position, the United Kingdom Government desired to reduce the quantities of meat to be lifted from Australia and New Zealand in order that ships might be diverted to nearer sources of supply. The figure of 198,000 tons, including 24,000 tons of baconer pork, was then substituted for the original 249,000 tons. To meet this altered situation further restrictions upon the receipt of certain classes of meat into store were imposed. These further restrictions were as follow:—

All boneless 2nd and 3rd quality cow beef.
All boneless beef briskets.
All boneless beef shins and beef shanks.
All beef offal, except beef livers and beef kidneys.
All veal offal.
All 1st, 2nd, and 3rd quality lambs under 23 lb.
All 1st and 2nd quality lambs over 42 lb.
All 3rd quality lambs over 28 lb.
All piece lamb.
All lamb offal except lamb livers.
All 2nd quality wether mutton.
All mutton offal except mutton livers and kidneys.
All porker pork, including chopper pork.
All offal from porker and baconer pigs.

With the imposition of these further restrictions it was felt that the carry-over at the end of the second contract year would be no greater than that carried over from the first contract.

On the 4th March a further cable was received from the High Commissioner stating the quantity of meat to be taken from Australia would have to be reduced to 144,000. The cable went on to say that if it was found possible to do so a greater quantity would be lifted. This drastic reduction following so closely upon that notified in January was a severe blow and the Meat Board was immediately summoned to consider what steps could be taken to safeguard the stability of the industry. Either the full Board or a Committee of the Board examined all aspects of the problem for several weeks, and eventually submitted recommendations to the Government.

The outlook for beef was considered to be better than for lamb and mutton. In the first place a fairly large proportion of the output of quarter beef is required to feed the armed forces in the Middle and Far East. And, secondly, even if beef is not required in the quarter, there is a very large outlet for it in the canned form. Although this would mean a decreased price to the producer there would still at least be an outlet.

Nevertheless, as regards beef, the United Kingdom Government requested that no more 3rd quality boneless ox beef should be shipped, and no more of this class was accepted into store after 30th April. To further safeguard the general quantitative position the Board also recommended that beef livers and kidneys, beef tongues, and 1st quality cow quarter and piece beef should not be accepted into store for export. The prohibition on tongues took effect from 30th April, and on beef livers and beef kidneys and cow beef from 31st May.

Main attention, therefore, was turned to the immediate and more difficult problem of mutton and lamb. It was agreed that every effort must be made to have as little meat as possible in store at the commencement of the new lamb season. To achieve this object it was decided to recommend to the Government that from 21st April no more mutton or lamb should be received into store for export until the commencement of the new lamb season. It was further recommended that attempts should be made to control the flow of live-stock into the markets so that the supply would not exceed the local consumptive demand. It was considered that only in New South Wales and Victoria would such regulation be necessary, and the State authorities were asked to take the necessary action. Both these recommendations the Commonwealth Government accepted. The Government felt, however, that they should go further and in case regulation of marketing of live-stock proved impracticable or did not achieve the object desired, the Government decided to buy lamb if prices fell unduly.

The situation that arose in our rapidly developing pig industry was particularly unfortunate. When it became necessary in January to place certain restrictions on export owing to the decreased total quantities of all classes of meat to be purchased by the United Kingdom Government, porker pork was prohibited export. As Britain had indicated her desire that as much baconer pork as possible should be shipped and as in the cut to 198,000 tons the 24,000 tons of baconers remained unaltered, it was felt that the pig industry might fairly be asked to forego the export of porker pork.

It came as a complete surprise to both the Commonwealth Government and the Board when a cable was received on 27th February saying that the United Kingdom would accept no more pigs of baconer weights, but that they would continue to accept porkers, the reason given being that butcher's pork, namely the porker pork, was now required in preference to pork for curing.

Strenuous efforts were made to have this decision reversed but without success. Then attempts were made to persuade the United Kingdom to allow shipment of those carcasses of baconers which were already in store. This the United Kingdom Government eventually agreed to do.

On 23rd April a further cable was received from the High Commissioner which stated that after further negotiations with the United Kingdom Government the latter had agreed to purchase and try to ship 198,000 tons up to 30th September. At the same time information was received that the quantities that it was anticipated available shipping could lift in the third year of the war would show a very great reduction. Having this prospect in view the Board did not recommend the lifting of the prohibition on the slaughter of mutton and lamb, as they might otherwise have done in view of the increase in the contract quantity up to 30th September to 198,000 tons.

Plan for Future of the Industry.

The vastly reduced shipping programme for the third year of the war has caused the Board very grave concern. However, a complete scheme for the control of the industry has now been

drawn up and submitted to, and been accepted in principle by the Commonwealth Government. It has been indicated by the United Kingdom Government that of the reduced shipping space available about five-eighths will have as its destination the Middle East, and the remainder will be for the United Kingdom. Shipments to the Middle East will be almost entirely beef, and it will be seen, therefore, that the space available for lamb, mutton, and pig meats will be extremely limited.

Lamb.

As mutton and pig meats can be disposed of in the canned form it has been agreed that all refrigerated space to the United Kingdom will be used for frozen lamb. Even under this plan it is considered that the space available will be entirely inadequate to lift a normal season's lamb production. The Commonwealth Government has, therefore, agreed to purchase to the end of the third contract year such grades and weights of export lamb as will be announced from time to time at the prices shown in the accompanying table :—

	F.O.B. Prices Paid by United Kingdom Government under Present Contract.	F.O.B. Prices to be Paid under Commonwealth Government Purchase Scheme.	
	All Lambs.	Spring Lambs.	Summer Lambs.
	Per lb. Australian.	Per lb. Australian.	Per lb. Australian.
	d.	*d.*	*d.*
1st Quality—			
D's	7·27	6½	5⅞
2's	6·95	6	5⅜
8's	6·80	5⅜	4¾
4's	6·33	4¾	4⅛
2nd Quality—			
D's	7·11	5⅞	5¼
2's	6·41	5⅜	4¾
8's	5·94	4¾	4⅛
4's	5·39	4⅛	3½
3rd Quality—			
L's	6·48	5¼	4⅝
O's	6·09	4¾	4⅛

It must be realized by producers that the prices they will receive will be about 1d. per lb. lower than those shown. This margin covers operators' costs and any profit.

It will be noted that these prices are lower than those in the schedule to the present United Kingdom contract. Also "Summer lamb" prices have been depreciated more than those for "Spring lamb" thus bringing them more in line with their price relationship of the pre-war period. *The heavier lambs also have been depreciated more than the lighter weights with the object of discouraging their production.* There is a margin between the price at which the Australian Government will buy and the price at which they will sell to the United Kingdom Government, but as the purchase will be on an "into store" basis the Commonwealth Government will be responsible for storage and interest, and will also accept the risk of the resale of their total purchase to the United Kingdom Government. With the exception of the difference in price the only major change from conditions operating previously is that "exporters" will sell to the Australian Government instead of to the British Government. *The scheme will operate from 1st July, 1941, and classes to be purchased will be D's, 2's, and 8's of 1st and 2nd quality.*

The conditions of purchase and the method to be adopted by exporters in the preparation of documents to obtain payment will be announced in due course.

Mutton.

No mutton will be shipped to the United Kingdom in the frozen form. The Government have agreed that they will buy from canning operators canned mutton from those sheep suitable for canning which would normally have come within the third (or higher) export frozen mutton grade. The price to be paid to the canning operators will be such as should enable them to pay a reasonable price for the canning mutton on the hoof. A close examination into the general level of prices paid will be made from time to time. It is hoped that under this plan a quantity of mutton will be withdrawn from the local market and that this may be replaced by lamb which in the future will be a lower priced article than in the past.

Pig Meat.

Pig producers no doubt are bewildered at the rapid changes of policy in regard to their industry. Some of these have been forced upon them by changing conditions in the United Kingdom and others to meet the ever-changing shipping position as it affects Australia. In view of the large quantities of porkers being placed in store it has become necessary to recommend that from 1st July next the weight range of pigs to be accepted into store for export shall be from 80 lb. to 110 lb. only.

As has been stated no frozen pork will be shipped to the United Kingdom in the third

[Continued on page 412.

Irrigated Pastures in the Goulburn Valley

By G. B. RAYNER, B.Agr.Sc., Assistant Agrostologist

THERE are two main types of irrigated pasture—pasture of annual species watered in the spring and the autumn, and pasture of perennial species watered right through the summer. It is principally the latter type which has been developed in the closely settled areas of the Goulburn Valley, and it is here that some of the best irrigated pastures in the State are to be found. The efficiency developed by certain farmers in this district has enabled them to increase the production of their farms to such an extent that areas which were formerly considered too small for a farm unit are now yielding quite a good living. It has been shown that this country can be made to carry more than a cow to the acre, and that gross annual returns of up to £20 per acre can be achieved. The development of these pastures is the result of the application of certain principles which have been determined experimentally by the Department of Agriculture, and the future development of the irrigated pastures in the Goulburn Valley, as elsewhere, will very largely depend on the extent to which the precepts of the Department are applied.

It might be contended that farming is an occupation which depends on judgment, and cannot be governed by a set of rules. That may be true to a certain extent, but the farmer whose judgment is based on a knowledge of well defined guiding principles has a much better chance of success than the farmer whose judgment has no such foundation. Some of the measures advocated by the Department of Agriculture are somewhat elastic, for example, seasonal conditions may necessitate a modification of the watering schedule; others, such as the top-dressing programme, leave very little room for compromise.

Manurial trials on lucerne were carried out at Tongala from 1925 to 1931. These trials rapidly demonstrated a marked response by the lucerne to liberal applications of superphosphate and the superiority of this manure to the others used. The lucerne plots were ploughed up in the spring of 1932 with the object of establishing pasture plots on the same site. The area was cultivated at intervals during the following summer. It was irrigated in April, again cultivated and graded, and sown to pasture during the second week of May, 1933. A comprehensive mixture of grasses and clovers was sown over the whole area, and strips 14 feet wide, at right angles to the checkbanks, were differentially top-dressed on exactly the same layout as the preceding lucerne manurial plots.

The following mixture was sown per acre:—Hawkes Bay perennial ryegrass, 15 lb.; Italian ryegrass, 6 lb.; cocksfoot (Akaroa strain), 6 lb.; Timothy grass, 2½ lb.; N.Z. red clover, 2½ lb.; N.Z. white clover, 2 lb.; alsike clover, 1¼ lb.; subterranean clover, 1¼ lb.; and strawberry clover, ½ lb. A good strike was obtained, and within a year an excellent sward had developed on all plots, with perennial ryegrass the dominant species. During the next two or three years the white clover rapidly increased and the other clovers diminished. To-day the pasture is a well balanced mixture of perennial ryegrass, cocksfoot, and white clover. It is relatively free from weeds except on the "no manure" strips, where flat weed, couch grass, Paspalum distichum, and other inferior species have intruded. Self-sown plants of Paspalum dilatatum are scattered over the whole area.

For the first five years the Tongala plots were of a purely observational character. While it was possible to see differences between the manured and unmanured strips of pasture, differences between strips receiving various amounts of manure could not be so easily detected. It was therefore decided to measure the production of the various plots by means of a motor lawn-mower, and mowing was commenced in June, 1938. As it was considered that continuous mowing over a period of years would be likely to upset the sward and might give rise to manurial responses which would not

A luxuriant growth of perennial rye grass under irrigation. It is associated with a dense undergrowth of irrigation white clover (obscured by the rye grass).

obtain under grazing, the plots were subdivided into two sections with the object of mowing and grazing each section for alternate periods of two years.

A pasture establishment trial was sown at Stanhope in 1926. This consisted of parallel strips of various grasses sown in one direction, and similar strips of various clovers and lucerne sown at right angles. The following species were sown:—Perennial ryegrass, cocksfoot, meadow foxtail, Timothy, Phalaris tuberosa, tall oat grass, white clover, red clover, alsike clover, strawberry clover, subterranean clover, scarlet clover, and lucerne. A good strike of all species was obtained, and all the legumes except scarlet clover made good development during the first year. The red and alsike clovers rapidly thinned out, and after two or three years they (and the scarlet clover) had practically disappeared from the sward. Perennial ryegrass and cocksfoot proved to be the best of the grasses, the development of the latter being particularly good. Italian ryegrass soon thinned out, and Timothy and meadow foxtail did not form a very dense sward. Phalaris tuberosa made good development, but it appeared to be the least palatable to the stock.

By 1937 the plots had lost their identity as a species trial, except for the cocksfoot strip, which was still well defined. During the previous ten years the whole area had been uniformly top-dressed at the rate of 2 cwt. superphosphate per acre per annum. In 1937 strips across the paddock were differentially manured with the following treatments:—(*a*) 2 cwt. superphosphate per acre; (*b*) 2 cwt. superphosphate plus 1 cwt. potassium sulphate per acre; (*c*) 4 cwt. superphosphate per acre; and (*d*) 4 cwt. superphosphate plus 1 cwt. potassium sulphate per acre. Potassium sulphate was tried because it had formerly given a response on lucerne plots in the district. During the following year no differences could be detected between any of the manurial strips, and it was decided to establish a comprehensive manurial trial on a uniform pasture in an adjoining paddock. The pasture selected had been established for six years, and regularly top-dressed with superphosphate. It was a dense and fairly uniform sward of cocksfoot and subterranean clover, with perennial ryegrass, Paspalum dilatatum, white clover, and lucerne also prominent. Since the test was established, the white clover has spread very rapidly at the expense of the subterranean clover and lucerne,

and it is now the dominant legume. Duplicate sets of plots were established for alternate mowing and grazing, and mowing commenced in June, 1938.

The layout of the plots at Stanhope is more suitable for a quantitative test than that at Tongala. On the other hand, the Stanhope plots, unlike those at Tongala, had been uniformly top-dressed with superphosphate for some years prior to mowing. This meant that reliable results at Stanhope could not be expected until the residual effect of this superphosphate had been dissipated, and the results for the first year were confusing and misleading. For this reason, whereas the accompanying table gives the average of the first two seasons at Tongala, the results for the second season only are recorded for Stanhope.

IRRIGATED PASTURE PLOTS ON PROPERTY OF J. BULLINGHAM, TONGALA.

Average of Results for Two Seasons (1938-39 *and* 1939-40).

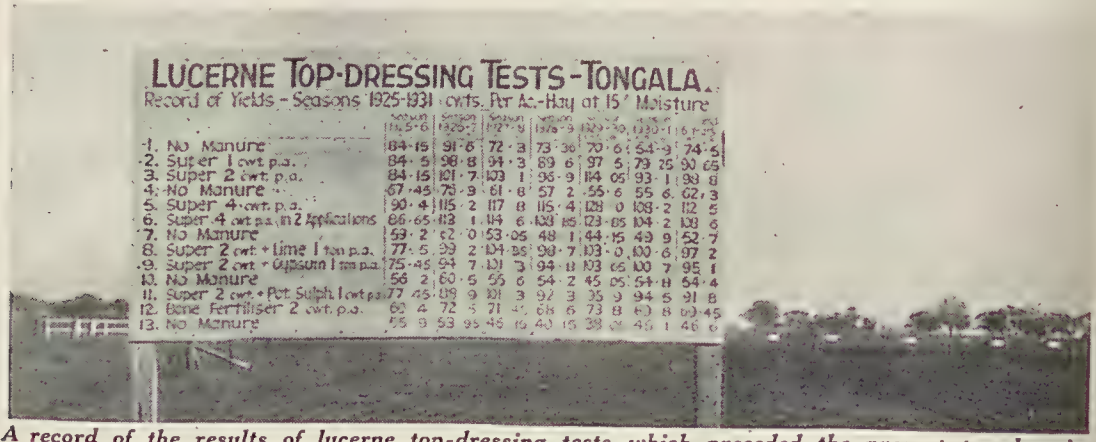
Manurial Treatment per Acre per Annum.	Dry Matter per acre (mean of 3 replicates).	Increase over No Manure.
	cwt.	cwt.
No manure	56·9	..
Super. 1 cwt.	61·0	4·1
Super. 2 cwt.	67·3	10·4
Super. 4 cwt.	80·8	23·9
Super. 4 cwt. (2 applications)	81·6	24·7
Super. 2 cwt. per annum + Lime 1 ton every 5 years	70·3	13·4
Super. 2 cwt. per annum + Gypsum 1 ton every 5 years	74·6	17·7
Super. 2 cwt. + Pot. Sulp. 1 cwt.	67·8	10·9
Bone Fertilizer 2 cwt. ..	67·8	10·9

IRRIGATED PASTURE PLOTS ON PROPERTY OF E. HADFIELD, STANHOPE.

Results for Season 1939-40.

Manurial Treatment per Acre per Annum.	Dry Matter per acre (mean of 4 replicates).	Increase over No Manure.
	cwt.	cwt.
No Manure	61·8	..
Super. 1 cwt.	68·0	6·2
Super. 2 cwt.	68·4	6·6
Super. 3 cwt.	85·7	23·9
Super. 4 cwt.	83·8	22·0
Super. 6 cwt.	88·4	26·6
Super. 2 cwt. + Amm. Sulph. 1 cwt.	74·5	12·7
Super. 2 cwt. + Pot. Sulph. 1 cwt.	74·0	12·2
Super. 2 cwt. + Amm. Sulph. 1 cwt. + Pot. Sulph. 1 cwt.	72·0	10·2
Super. 2 cwt. + Lime 10 cwt.	70·2	8·4
Super. 2 cwt. + Gypsum 10 cwt.	76·6	14·8
Super. 2 cwt. + Amm. Sulph. 1 cwt. + Lime 10 cwt.	67·7	5·9

It will be seen that at both these centres the liberal application of superphosphate proved to be the best manuring practice. At Tongala, lime and gypsum gave an increase in yield when applied in addition to 2 cwt. of superphosphate, but potash gave no response. At Stanhope, lime, gypsum, ammonium sulphate, and potash all gave an increase over 2 cwt. of superphosphate by itself. In none of these instances was the increase in yield as great as that obtained by the addition of more superphosphate. The yield of the bone fertilizer plot at Tongala compared favorably with that of the "Super. 2 cwt." plot; but as bone


LUCERNE TOP-DRESSING TESTS - TONGALA.
Record of Yields - Seasons 1925-1931 - cwts. Per Ac.-Hay at 15% Moisture
1. No Manure
2. Super 1 cwt p.a.
3. Super 2 cwt p.a.
4. No Manure
5. Super 4 cwt p.a.
6. Super 4 cwt p.a. in 2 Applications
7. No Manure
8. Super 2 cwt + Lime 1 ton p.a.
9. Super 2 cwt + Gypsum 1 ton p.a.
10. No Manure
11. Super 2 cwt + Pot. Sulph. 1 cwt p.a.
12. Bone Fertiliser 2 cwt. p.a.
13. No Manure

A record of the results of lucerne top-dressing tests which preceded the present top-dressing tests at Tongala.

An excellent irrigated pasture on the property of Mr. J. Bullingham, Tongala. The experimental plots may be seen in the background.

fertilizer is more expensive than superphosphate, it would need to yield considerably more before it could be recommended as a substitute.

With regard to the amount of superphosphate to apply it should be noted that the increase obtained from 2 cwt. per acre at Tongala was more than doubled by the addition of an extra 2 cwt. The advantage of applying superphosphate at a higher rate than 2 cwt. per acre was still more marked at Stanhope, where 3 cwt. per acre was the optimum dressing. There was no evidence to show whether 3 cwt. per acre would have been as effective as 4 cwt. at Tongala. However, the results from these plots justify the recommendation of an annual dressing of two bags of superphosphate per acre for the irrigated pastures in this area. The plots at Tongala show that no advantage is derived from dividing the annual quota of superphosphate into two applications, one in the spring and one in the autumn. This has been confirmed by tests in other districts. It is therefore recommended that the full annual dressing of manure be applied in the autumn.

The amount of superphosphate that can be profitably applied to a pasture depends (within limits) on the frequency with which the pasture is watered. The Tongala plots have always had available sufficient supplies of water; those at Stanhope suffered restrictions during the 1938-39 season, but in 1939-40 an adequate irrigation schedule was maintained. It is considered that such good responses to liberal manuring would not have been obtained if the interval between waterings had been extended. The frequency of irrigation which a pasture will require depends on the climate, the nature of the soil, and to some extent on the slope of the land. The last two factors determine the amount of water absorbed at each irrigation. Generally speaking, the soil of the Goulburn Valley is comparable in this regard to the soil of the State Research Farm at Werribee, where a watering and manurial test has revealed that applications of more than 2 cwt. of superphosphate are worthwhile only when the interval between waterings does not exceed a fortnight during the summer months. It is considered that this would also apply to the area under review, and a fortnightly watering schedule is therefore recommended. If this should not be practicable, the disadvantage of an enforced longer period between waterings can to some extent be overcome by the application of a supplementary watering; that is, irrigating the pasture two days in succession.

It has been stated earlier that seasonal conditions may bring about a modification of the

watering schedule. During very hot weather, a period of fourteen days between waterings may be too long; and, conversely, during a wet spell a longer period may be advisable. In the latter regard a good deal of care should be exercised. It must be remembered that the ground receives about 2 inches of water at an irrigation; therefore, a fall of rain of, say, half an inch, would be an excellent supplement to, but not a substitute for, a regular watering. Consideration should be given to just what a fall of rain means to a pasture before irrigating is postponed.

Whereas adequate watering and manuring are essential for the maintenance in full production of a first-class pasture, another aspect of the matter is the building up of a poor pasture sward into a good one. Top-dressing does not merely increase the yield of the existing species; but, by promoting the development of the more valuable plants to the exclusion of the inferior types and weeds, it improves the quality of the pasture, and thereby lengthens as well as strengthens the periods of high production. The composition of a pasture depends very largely on the treatment it receives in respect of water and manure. For instance, if a pasture which contains subterranean clover and white clover is lightly top-dressed and watered infrequently during the summer, the subterranean clover will persist. On the other hand, if the pasture is liberally top-dressed and watered frequently, the white clover will thrive and exclude the subterranean clover from the sward.

An important factor in pasture utilization is grazing management. Under a system of rotational grazing, two things have to be decided; firstly, the extent to which the stock should be allowed to graze each paddock, and secondly, the period of rest which the pasture is to be allowed between successive grazings. Over-grazing should be guarded against, as the pasture sward may be damaged if the stock are allowed to remain too long on one paddock. There is a greater likelihood of neglect in this regard with sheep than with dairy cows. The stock should be moved on before the paddock is eaten right out; this will enable the pasture to recover quickly and make a good growth for the next grazing. By maintaining a good cover on the paddock, weeds and undesirable species will not be permitted to intrude. The length of the recuperation period allowed between successive grazings exerts an influence on the fodder value of the pasture. **Many diseases of the grazing animal are caused or aggravated by nutritional disorders resulting from an ill-balanced diet; experiments at the State Research Farm at Werribee have shown that an irrigated pasture does not form a balanced diet for the stock until it is about a month old. This period therefore is recommended as the length of time for which a pasture should be spelled between grazings.**

Summary.

Irrigated pasture experiments in the Goulburn Valley and elsewhere have shown that white clover, perennial ryegrass, and cocksfoot are particularly well adapted for growing under irrigation in this district; that superphosphate by itself is the best manure for these pastures—an annual dressing of two bags per acre is recommended; that no advantage is derived from splitting the annual quota of manure into two applications; that pastures in the Goulburn Valley will require watering at intervals of not more than a fortnight during the summer to maintain maximum production and take advantage of heavy applications of superphosphate; that an enforced longer period between waterings can to a great extent be overcome by the use of a supplementary watering; that the stock should not be allowed to remain too long on the pasture at each grazing; and finally that a balanced diet for the stock will be achieved by giving the pasture a recuperation period of one month between successive grazings.

The Construction of Dairy Buildings

By A. F. BOTTOMLEY, Dip. Agr., and W. A. GYLES, Dairy Supervisors

FOREWORD by J. M. KERR, SUPERINTENDENT OF DAIRYING.

Some time ago at the request of dairy farmers, the Department of Agriculture prepared diagrams of dairy buildings to serve as a guide to intending builders, particularly in those municipalities where there is no dairy supervision. These plans subsequently were issued in pamphlet form with instructions for their use, under the title "Dairy Buildings". The aim was to show, as nearly as practicable, the minimum as regards milking shed and dairy construction that could be fully approved by this Department for purposes of a licence, or, in other words, the simplest construction consistent with both serviceability and sanitation. The pamphlet was issued as a guide to the general principles to be observed in constructing dairy buildings. The plans and specifications were prepared with a view, among other things, to economy and detail was studiously limited to give the farmer as much liberty as possible in all features not involving sanitation. The principles expressed and illustrated in the pamphlet will stand, but the actual details of construction are left to the builder's discretion and judgment.

From time to time the Department has received requests from farmers for more detailed and elaborate plans. To meet this request, plans and specifications have been prepared and are included in the following article. The plans of both buildings omit practically nothing in the way of building details and are carried to a completeness of finish not actually insisted on by the Department. While meeting the request for fuller plans, it is pointed out that, as far as construction is concerned, the Department will be satisfied if the general principles given in the pamphlet "Dairy Buildings" are observed. This pamphlet may be obtained by application to the Director, Department of Agriculture, Melbourne, C.2.

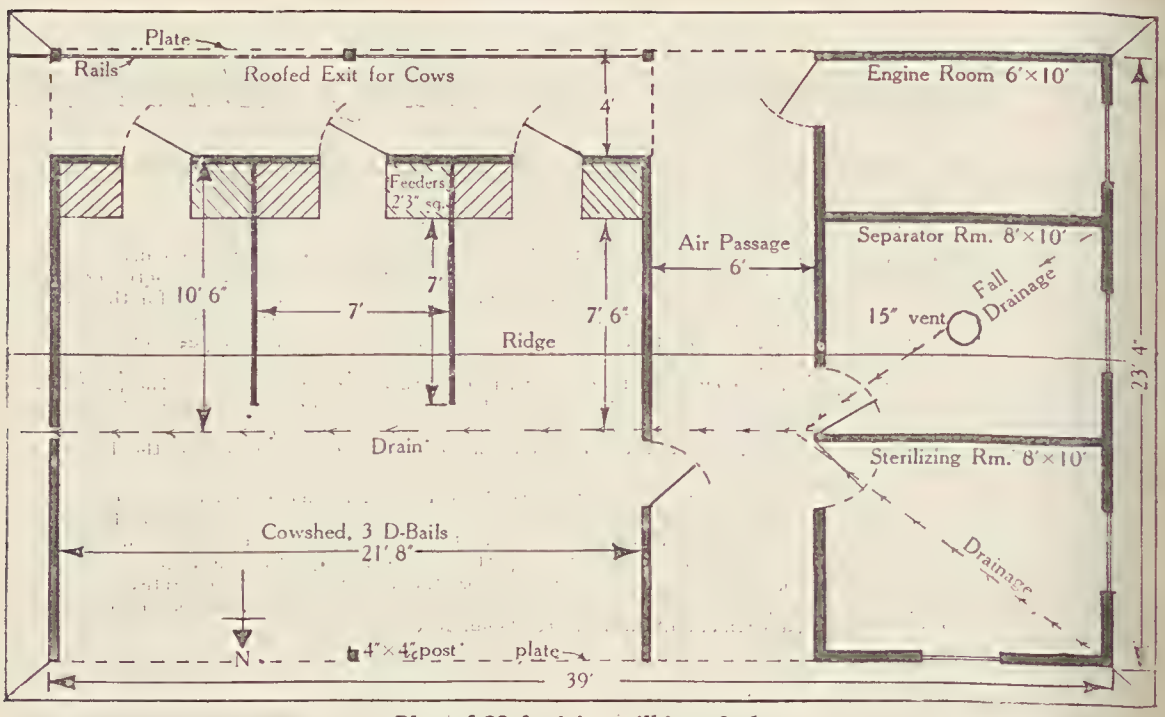
IF clean milk and choice butter are to be produced many factors involving the practice of dairy hygiene must be considered. Scrupulous cleanliness, of course, is one of the most important factors, and this may best be practised in dairy buildings which have been so constructed as to facilitate cleaning operations and to permit the proper storage of milk and cream away from heat, dirt, and flies.

In the early years of the dairying industry in Victoria, the Department of Agriculture appointed dairy supervisors to inspect sanitation facilities, to advise on feeding and production problems generally, and to assist in the planning and layout of new buildings. This has resulted in a progressive improvement in the industry during the intervening period. In recent years, however, and particularly since the embargo on the use of preservatives, problems confronting the industry have become more numerous and complex. This situation calls for an even closer contact between the Department and the dairy farmer if these problems are to be successfully grappled with, and dairying efficiency maintained and improved.

In the construction of dairy buildings the underlying principles remain the same whether the dairy herd be large or small. The particulars and plans supplied in this article should prove equally as helpful to the farmer with half a dozen cows as to the owner of a large herd.

Selection of Site.

The milking shed, where possible, should be centrally situated so that long walking distances by the cows may be avoided. The site should possess natural drainage or be well built up. In all cases, except on natural slopes, the site must be a foot at least above surface level to facilitate drainage. If possible, the milking shed should be on the easterly side of the dwelling so that the separator room and sterilizing room will be on the west side of the milking shed. Thus stock will not traffic between the dairy buildings and the dwelling. The open side of the milking shed may face anywhere between north and east. If it faces east, the early morning sun in the summer may be found to be too hot. Facing the open side to the north-east generally is found most suitable and is advisable particularly from the hygienic viewpoint, as it permits the maximum amount of sunshine in the winter. The sunlight has sterilizing powers and helps to keep the milking shed dry and sweet. An open shed is

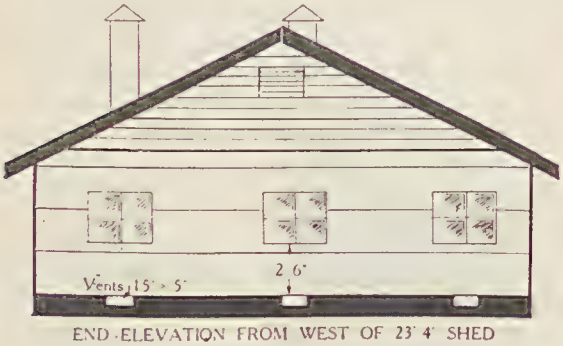


Plan of 23 ft. 4 in. milking shed.

always sweeter than an enclosed shed, and there is no reason whatever why a cow shed should not have one side open. Pig sties, fowl pens, stables, &c., are required to be at least 150 feet away, and if possible not in the direction of the prevailing winds.

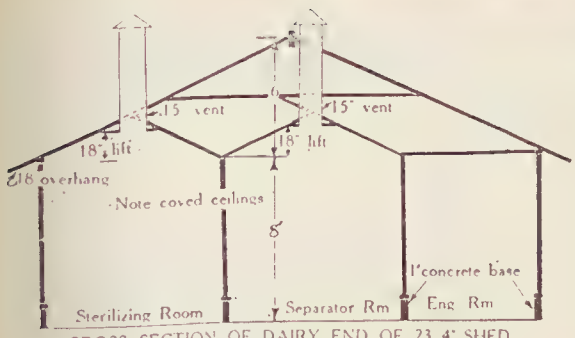
Sizes of Rooms.

In practice it has been found, even where cream is being produced, that an area less than 8 feet x 10 feet x 8 feet is insufficient. Where whole milk is produced for sale and herds are big a somewhat larger area is necessary, and in this matter, as in the selection of the site, the local dairy supervisor should be consulted. For both the separator and wash rooms 8 feet x 10 feet x 8 feet normally will be found sufficient, for the moderate sized herds. Many farmers have found it advantageous to increase these sizes, particularly that of the wash room. The engine room is generally 6 feet x 10 feet, but some engines require a greater width than 6 feet. On the other hand, electric installations do not take up so much room and in such cases 4 feet wide will be sufficient.



END ELEVATION FROM WEST OF 23' 4" SHED

END ELEVATION FROM EAST SHOWING ROOFED EXIT



CROSS SECTION OF DAIRY END OF 23 4" SHED

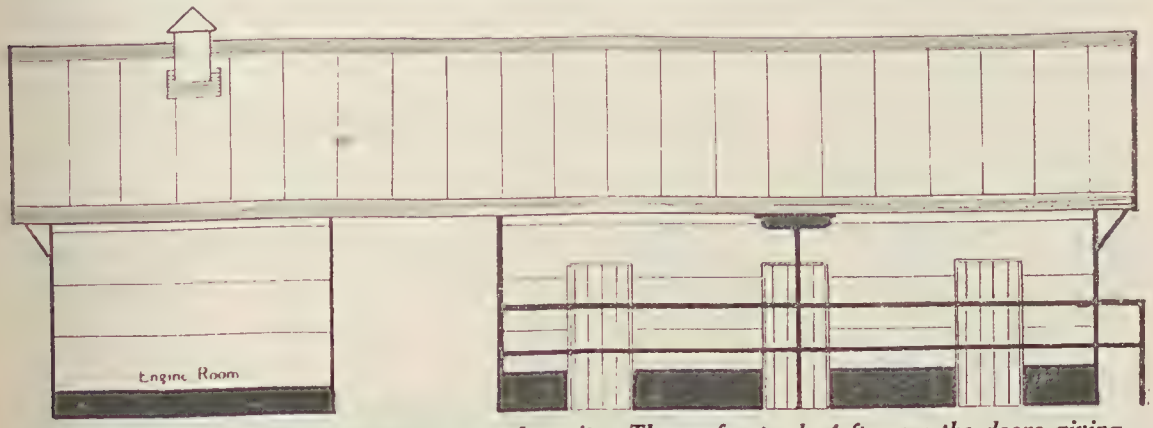
Construction.

The milking shed should be set on a concrete base (i.e., a "dwarf" wall) preferably as high as 18 inches from inside finished floor level. On both ends of the shed this may be advantageously increased up to a height of 3 feet, but in this case the wall should be reinforced. The reason for a concrete base in all dairy buildings is to keep the woodwork out of both water and white ant lines, thus adding greatly to the life of the buildings. While the building may be constructed of brick, reinforced concrete, stone (rendered), or concrete brick, the following particulars are for buildings of wood frame set on a concrete base, externally lined with corrugated iron, and internally lined with flat iron. Cement sheets are also an approved lining material. The milking shed is not lined.

The separator and wash rooms should have a concrete base of at least 12 inches high from inside floor level. This may be higher if desired, although in the latter case care should be taken to set the bottom of the ventilators about 5 inches from the floor level. There should be at least three ventilators in both rooms, size 15 inch x 5 inch, or enough woven wire vents to give a similar area of ventilation. Details are given in the elevations.

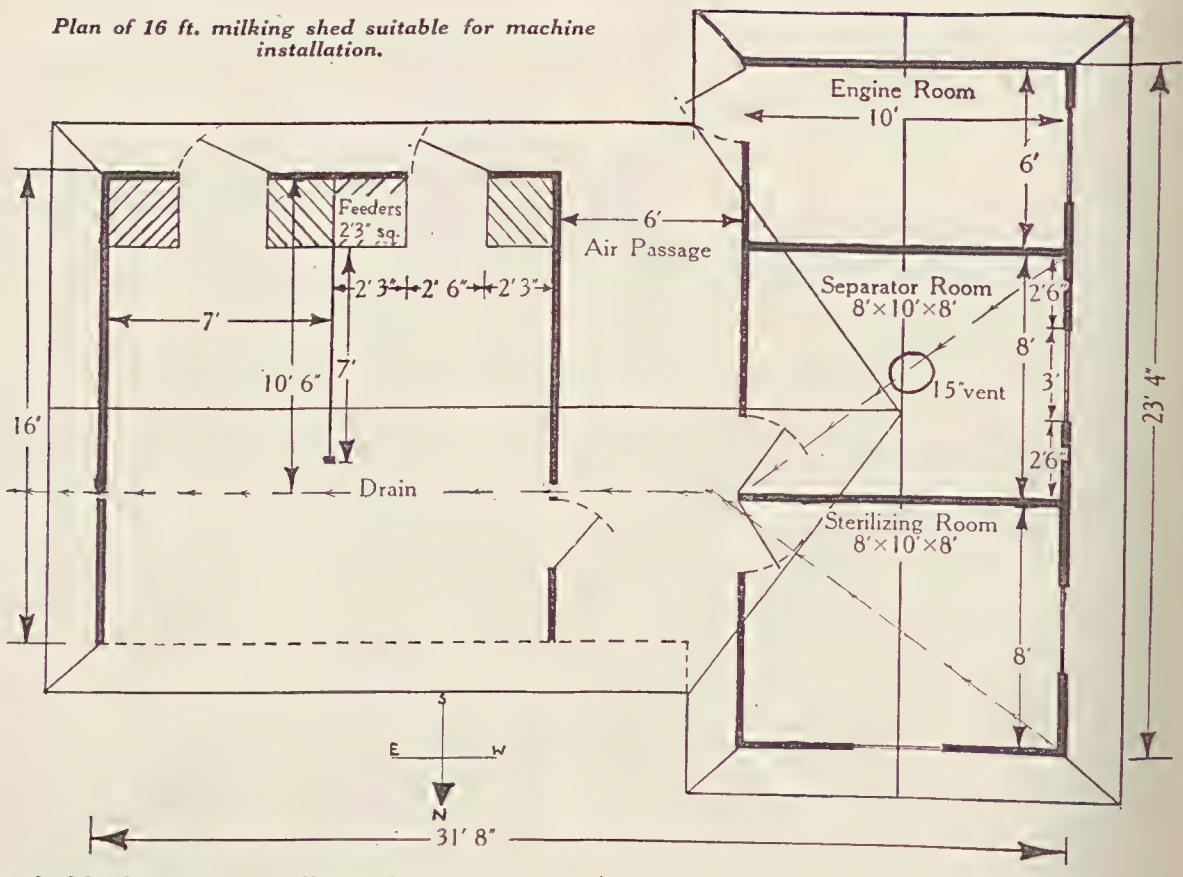
Drainage is an important point to remember when laying out the site. Drainage from the milking shed should never run back towards the separator room. Both separator and wash rooms should be drained across the airway through the cow shed, thus helping to flush the milking shed drain. It is necessary to take the drainage at least 30 feet away from all dairy buildings. The drain, particularly from the milking shed, should be wide so as to prevent breaking up by stock, and constructed preferably of concrete or brick. Wherever possible, this drain should flow into a general farm drain so as to prevent any malodorous accumulation close to the milking shed. If necessary the drain should be fenced up to the point of absorption so as to keep stock away from the polluted growth.

In all cases walls should be at least 8 feet high, inside measurement. The separator room should be lined with flat iron, cement sheets, or other approved impervious material. The completed building would include the lining and ceiling of the wash room as well. In the case of brick, concrete, stone, or cement-brick construction these rooms should be cement rendered, the rendering having a smooth "glass" finish. All windows are 3 feet by 2 ft. 6 in., but may be larger if desired, and are a combination of hoppered and sash window. Normal position is hoppered but can be



Elevation of 23 ft. 4 in. shed as seen from the exits. The roof extends 4 ft. over the doors giving a protected race. The end elevation of this shed from the east is given on the previous page. There is no necessity for vents in the engine-room.

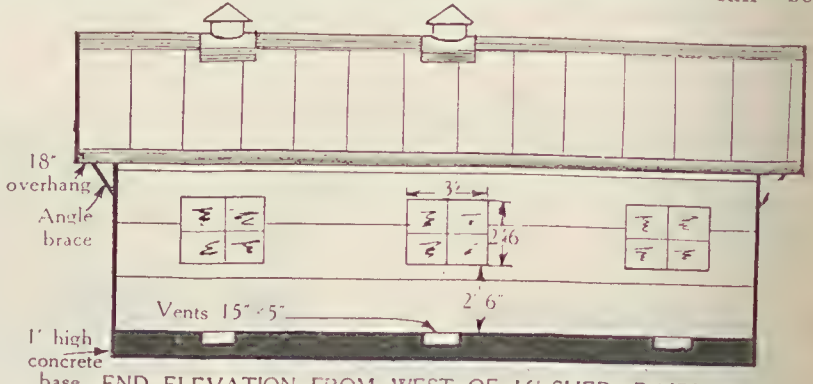
Plan of 16 ft. milking shed suitable for machine installation.



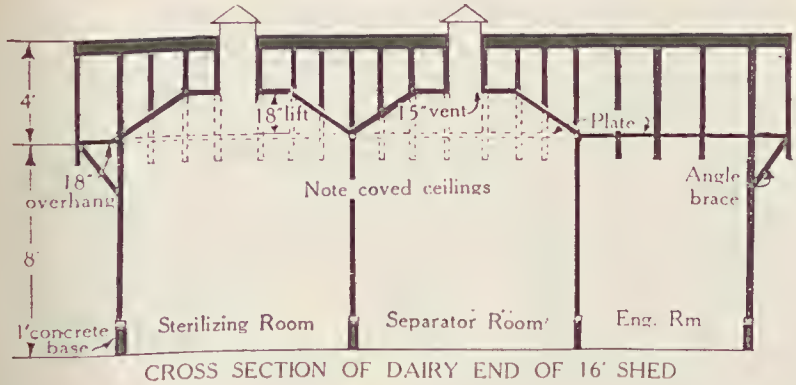
pushed back and up (see illustration on p. 381). All doors are standard 2 ft. 6 in. x 6 ft. 6 in., although some farmers prefer the exit doors of the milking shed to be 2 ft. 9 in. wide. This can be easily done by decreasing the size of the bail heads. The doors into the separator and sterilizing rooms have a fly-wire panel in the top half. In most buildings it is preferable to have these doors opening out into the air-way thus conserving space inside the rooms. A double-action swing door is the best. The separator room has a coved ceiling with a lift of at least 18 inches (see cross section on the previous page) and coved to an approved cylinder ventilator.

Floors.

Great care should be taken with the laying of floors. In the construction of dairy buildings foundations and floors are of particular importance. Much labour in the future can be saved by seeing that they are properly graded. On no account should floors be less than 4 inches thick nor should the mixture ever be weaker than in the proportions of 4-2-1. Great care should be taken with the finished surface. If it is at all rough or has stone showing, wear will soon take place. Nevertheless an oversmooth floor can be



END ELEVATION FROM WEST OF 16' SHED DAIRY END



CROSS SECTION OF DAIRY END OF 16' SHED

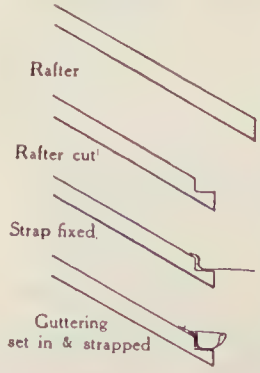
dangerous. Finishing with a wooden trowel rather than a steel trowel is recommended. When in use should any slippery spots appear, a little sand thrown over the surface will prevent the cows from slipping. Floors of separator and wash rooms should be in table drainage towards the doors and thence across the air passage to the milking shed drain. In the milking shed, where the drain is 10 ft. 6 in. from the front of the stall, a fall of 2½ inches will be found sufficient. In a shed 16 feet wide the amount of fall from the line of entrance to the drain will be about 1 inch. At the entrance of the shed either the small holding yard (say 6 feet wide) should be concreted or a concrete plate at least 3 feet wide should be laid. It is a better practice to have the main yard at the end of the shed rather than on the side of the entrance. With frontal yards there is always the danger of dry manure being blown into the milking shed and in the direction of the dairy building. A second advantage with an end yard is that the cows can be worked in rotation. For this purpose the end yard should be divided. In the dividing fence is a good position for a water trough. The cows are yarded, go from the main yard to the holding yard, then into the shed to be milked, then through the exits and by means of the exit race are returned to the main yard.

ELEVATION FROM EAST

Elevation of 16 ft. shed from the east.

Bail Fittings.

While metal fittings are ideal, timber fittings are permissible. In the latter case care should be taken to see that there is the minimum amount of obstruction on the floor. For instance the bail or feeder fittings should either be suspended from an overhead bar (see illustration on p. 383) or set on a rounded concrete base. This greatly facilitates the cleansing of the shed floor.

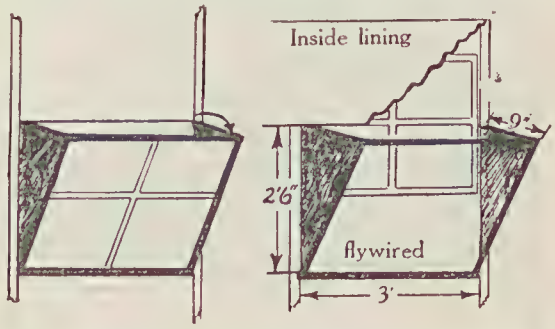


Exits.

To prevent puddling and bogging at the exits, concreting out at least 4 feet is strongly advised. It is extremely advisable to extend the roof well over the exit. This also prevents the undesirable puddle at the exits from the shed. Amongst other fittings in the shed provision should be made for supporting containers for water for washing hands and udders. If practicable, running water should be laid on.

Fittings in Separator Room.

The board carrying the pipe lines and releaser must not protrude through the wall

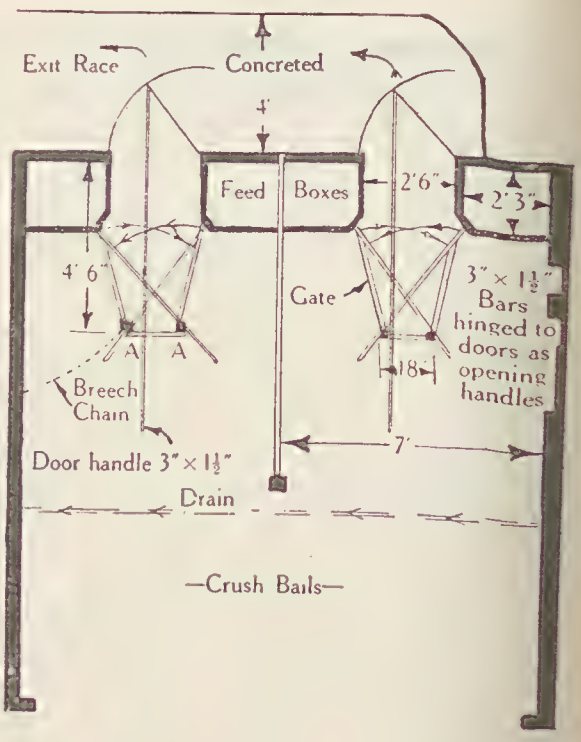


Left; Hoppered window leaning inward—normal position; Right; Window pushed back from hopper and raised.

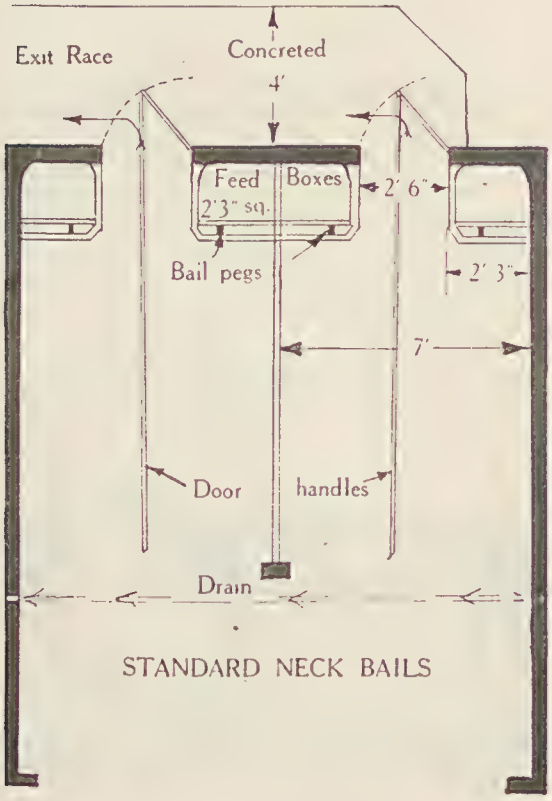
of the separator room. The vat stand should either be of iron or some other metal or piping and, if a fixture, should be angled back to the wall so that there will not be any obstruction on the floor. The top of the frame may be made of a wooden frame sheeted with flat iron. Provision should be made to allow the steam hose to be placed under the vat so that in cold weather the milk may be warmed to about 98 degrees F. If this is not done a very considerable amount of butter-fat can be lost. The bearing bracket must be of metal with no wooden posts. The separator should not be set on a wooden block. Either concrete or an earthenware pipe filled with concrete will be found satisfactory.

Fittings in Wash Room.

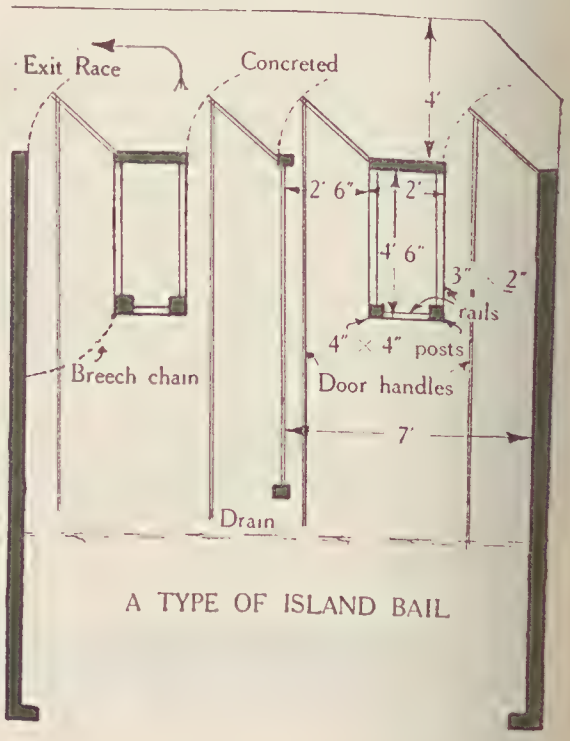
It is permissible to install the boiler in the wash room, but many progressive farmers find it advisable to provide a small annexe outside the room for this purpose. This means that ashes and fuel are kept outside, space is conserved, and in summer the room is not nearly



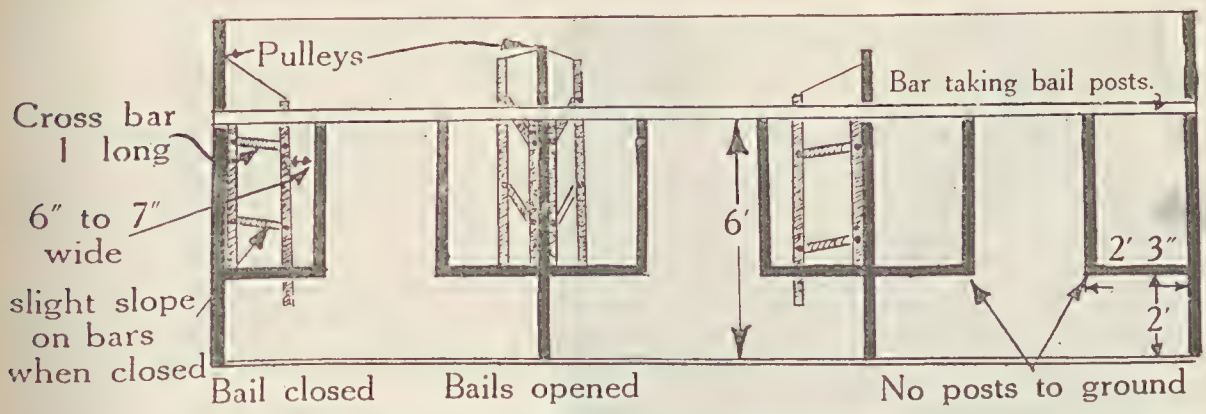
—Crush Bails—



STANDARD NECK BAILS



A TYPE OF ISLAND BAIL



WOODEN BAILS WITHOUT OBSTRUCTION ON FLOOR

as hot as it would be if it housed the boiler. Except where movable racks or troughs are used, the separator room fittings should be without legs, the troughs, racks, &c., being braced back to the walls. A double compartment trough has many advantages over a single compartment trough, utensils being more easily and quickly washed. A suggested size for a double trough, which can be made out of galvanized flat iron, will be found in the specifications given in this article. Cheap racks can be made out of piping attached to the wall with chain link wire stretched on it.

When installing the engine care should be taken to ensure that the exhaust from the engine is emitted well outside the engine room, preferably through the wall. When a

Inside of milking shed showing wooden bail fittings, with no floor obstructions.

The separator is fixed to a concrete base set in an earthenware pipe. The vat stand has a flat-iron surface, and is angle braced to the wall, leaving no floor obstructions. Note ventilator under the vat stand.

Double compartment trough in the wash-room, with chain-wire rack on left. Note hoppered windows, and ventilators below.

high concrete base is being constructed it is well to remember that a hole should be left in it for the exhaust pipe. Full regulations cover the actual installation of the machines and the local dairy supervisor should be consulted both when machines are first considered and also when the mechanic arrives to install. In this way, mistakes which are sometimes costly, can be avoided. The above details of the buildings are intended as a guide; variations can be made to suit special requirements, particularly where whole milk is handled or where the country is very hilly. However, the principles regarding sizes, ventilation, linings, &c., should still be observed. The local dairy supervisor should be consulted so that a plan is signed before building begins.

Quantities of Cement, Stone and Sand.

(A) For two double bail milking shed, 16 feet wide, 6-ft. air space, engine room, separator, and wash rooms, concrete bases, and 4-ft. exit race, but not including entrance yard.

50 bags of cement (paper bags).
7½ cubic yards of ¾-in. stone.
4 cubic yards of fine sand.

(B) For an extra double bail, 7 feet wide.

9 bags of cement.
38 cubic feet of stone.
19 cubic feet of sand.

(C) For an entrance yard 6 feet wide and 14 feet long.

6 bags of cement.
24 cubic feet of stone.
12 cubic feet of sand.

(D) Quantity required for an 8 ft. × 10 ft. × 8 ft. separator room.

7½ bags of cement.
30 cubic feet of stone.
15 cubic feet of sand.

(E) For two double bail milking shed alone.

24 bags of cement.
96 cubic feet of stone.
48 cubic feet of sand.

(F) Exit race 4 feet wide and 14 feet long.

4 bags of cement.
16 cubic feet of stone.
8 cubic feet of sand.

(G) The air space takes approximately six bags of cement.

(H) A yard 24 feet by 40 feet will hold 40 dehorned cows and can take up to 50 cows.

Size of double compartment trough is 5 feet long, each compartment 2 ft. 6 in. long, 20 inches wide, and 12 inches deep. The steamer platform should be sloped toward the trough, and suggested size is 2 feet long and 20 inches wide.

A chain-wire rack fixed to a metal-piping frame. Such racks are easily made and are ideal for quick draining and drying. Note the clean appearance of washroom due to the flat-iron wall lining.

Materials for 23 ft. 4 in. Milking Shed.

For quantities of cement, see Table above.

Red Gum—	
4 x 4 Posts	12/10.
Hardwood—	
4 x 2 Wall Plates	1/24, 2/20, 2/18, 4/11.
4 x 1½ Studs	62/7, 11/10.
2 x 1 Braces	150 feet.
4 x 2 Top Plates	2/24, 1/22, 2/20, 2/10.
6 x 2 Beams	2/17, 2/13.
5 x 1½ Rafters	30/15.
3 x 1½ Purlins	14/42.
8 x 1¼ Ridge	1/42.
4 x 1½ Collars	13/3.
4 x 1½ Gable Studs	24/6.
Oregon, Dressed—	
8 x 1¼ Barges	4/15.
Iron Roof	86/8 x 26 gauge corrugated.
Iron Walls and Gables	14/10, 14/6, 48/8, x 26 gauge.
Plain iron for Wash and Separator Rooms	40—6 x 3 x 26 gauge.
Spouting	24/6 4½-in. O.G. and 48 brackets.
Down Pipe	8/6 3-in. down pipe.
Ridge Cap	7/6 16-in. ridge.
Hardwood—	
4 x 1½ Ceiling Joists for coving Separator room	7/9. } If wash room ceiling is coved, this must
3 x 1½ Nogging for Cove	10/10. } be repeated.
T. and G.—	
6 x ½ Bird Board	2/11.
Doors	2 fly doors complete with jambs and stops, architraves and fittings, 6 ft. 6 in. x 2 ft. 6 in.
,,	6 ledged and braced doors complete with fittings, 6 ft. 6 in. x 2 ft. 6 in.
Windows	4—3 ft. x 2 ft. 6 in. hoppered frames.
Vents	2—15-in. cycl. vent.
,,	12—15 x 5 woven wire or fly-wire.
7 x ⅜ Bolts	72.
Red Gum—	
4 x 4 Bail Posts	4/9.
Hardwood—	
4 x 2 Bar	1/22.
4 x 1½ Frame	12/4, 12/2.
3 x 1 ,,	12/5, 12/1.
	Nails, solder, acid, rivets, &c.

Materials for 16 ft. Milking Shed.

For quantities of cement, see Table above.

Red Gum—	
4 x 4 Posts	10/10.
Hardwood—	
4 x 2 Wall Plates	1/24, 1/18, 1/16, 1/14, 1/10, 4/11.
4 x 1½ Studs	26/7.
2 x 1 Braces	150 feet.
4 x 2 Top Plate	3/16, 2/14, 2/13, 4/11.
6 x 2 Beams	1/23, 1/7.
4 x 2 Rafters	22/9, 18/11.
3 x 1½ Purlins	20/12, 20/14.
8 x 1 Ridge	4/14.

8 x 1 Valleys	2/14.
6 x 1 V. Boards	4/14.
3 x 1 ,,	4/14.
4 x 1½ Collars	9/9, 9/6.
4 x 1½ Gable Studs	22/5.
Oregon, Dressed—	
8 x 1¼ Barges	4/9, 2/11.
Iron Roof	30/9, 56/6, corrugated iron.
Plain iron for wash and separator rooms	40 sheets, 36 x 26.
Spouting	22/6 4½-in. O.G. and 44 brackets.
Down Pipe	8/6 3-in.
Ridge	11/6 16-in. ridge cap.
Valleys	4—36 x 26 plain iron.
Hardwood—	
4 x 1½ ceiling joists for coving separator room	7/9. } Repeat for washroom ceiling.
3 x 1½ Nogging for Cove	10/10. }
T. and G.—	
6 x ½ Bird Board	2/24.
Doors	2 fly doors complete with jambs and stops, architraves and fittings, 6 ft. 6 in. x 2 ft. 6 in.
,,	4—6 ft. 6 in. x 2 ft. 6 in. L. and B. complete.
Windows	4—hoppered frames.
Red Gum—	
4 x 4 Bail Posts	3/9.
Hardwood—	
4 x 2 Bar	1/14.
4 x 1½ Frame	8/4, 8/2.
3 x 1 ,,	8/5, 8/1.
Bolts	72—7 x ⅜.
Vents	1—cyl. vent.
,,	12—15 x 5 vents.
	Nails, solder, acid, rivets, &c.
Iron for walls and gables	40/8, 18/6.

Recording and Marking of Chickens

The recording and marking of chickens present an even greater problem than for other stud stock. Each breeding hen may produce several dozen chickens in the one season and the marking or branding of chicks must be done soon after hatching, before their identity is lost. The chick then is very small, and the scope for branding limited.

In the first place the eggs to be used for hatching must be marked as they are collected each day. During incubation it is not necessary to separate the eggs from different matings until the eighteenth or nineteenth day. Each hen's eggs should then be placed in pedigree trays—small wire boxes—in which the chickens hatch. As they are taken from these trays the chicks should be branded. They may then be allowed to mix with the other chicks.

The branding is done by piercing the small membrane or web between the toes with a punch or with a hot needle. The latter is preferred, as the searing prevents bleeding and the hole is less likely to close up. There are two webs on each foot which allow for four single brands, and by marking two or three webs about fifteen different brands are available. To simplify the recording of the brands the webs may be lettered from right to left A, B, C, and D. A brand on the outside web of the right foot would then be recorded as "A," and on both webs of the right foot "A.B.," and on both webs of the right foot and the outside web of the left foot, "A.B.D.," and so on. For farmers and others who run a small flock of fowls on free range, it is advisable to brand each year's chickens differently, so that their ages will always be known and old birds disposed of when they become unprofitable.

Budding, Grafting, and Methods of Re-working Fruit Trees

By

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Budding.

BUDDING is the term used for the operation of inserting a bud beneath the bark of the stock on to the growing surface of the wood. It is a simple and quick operation, and, if the amount of scion wood is limited, it is the most economical method of propagation. Nurserymen adopt this method largely in raising young fruit trees, and it is used also for the re-working of trees. For stone fruits it is by far the safest method of propagation.

Time to Bud.—Summer and autumn are the main seasons for *dormant budding,* so-called because the buds generally remain dormant until the following spring. It is done during the period of active growth. *Spring budding* will be dealt with later. Budding is performed when the sap in both the stock and the scion is moving freely. That shoots on the stock are still growing and that the bark of both stock and scion easily separate from the wood serve as good indications that budding may be commenced.

It is useless to bud when the bark of the stock does not lift easily. Also, for satisfactory healing, the sap in the stock should be active for a few weeks after budding.

It is important also that the buds themselves be at a suitable stage of development, as will be explained later. It is not advisable to bud during wet weather, because water running down the stock enters the "T" opening and interferes with the union of the bud and stock.

As budding depends so much on the state of the stock, the following recommendations must be considered only as a general guide.

Stone fruits should be budded in summer (January and February) because their growth ceases before that of pome fruits. Cherries and plums should be budded first, followed by apricots, peaches, and almonds. Apples and pears are usually budded from February to March or April, according to the season and locality.

Citrus can be budded in spring, summer, or autumn, and November, March, and April are considered the best months. Citrus trees have several growth periods in one year, and therefore more opportunities exist for budding them. Citrus trees in northern Victoria were still in a fit condition to bud as late as May this year (1941).

Fig. 8.—Portions of suitable (b) and unsuitable (a and c) apple bud-sticks.

(*a*) Blossom buds, (*b*) mature growth buds, (*c*) older buds. Note:—Some basal remains of petioles have been removed.

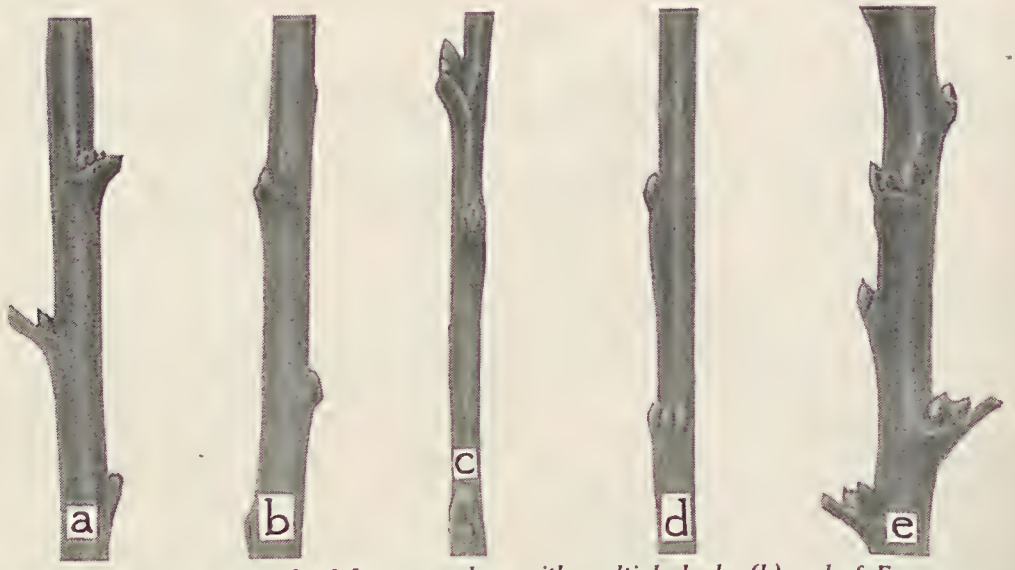

Fig. 9—(a) Portion of bud-stick of Japanese plum with multiple buds, (b) and of European plum with single (growth) buds; (c), thin peach lateral with blossom buds only—unsuitable for budding; (d and e), portions of bud-stick of peach (d) and apricot (e) with multiple buds—suitable. Note:—Some basal remains of petioles have been removed to show the buds.

Selection and Cutting of Bud-Sticks.

As with all scions, it is important to obtain bud-sticks only from high yielding trees, free from fungous and virus diseases and insect pests. A bud-stick is a mature shoot of the current season's growth removed from the tree to serve as a convenient form of handling and supplying buds. In spring budding, the previous season's growth is used. Any fruit tree which mutates, or "sports," should be avoided.

Suitable and unsuitable bud-sticks are shown in Figs. 8 and 9. Suitable bud-sticks should be as thick as an ordinary lead pencil, or, in the case of vigorous growth, thicker shoots can be used. The individual buds of fruit trees differ from one another. They may be either growth or blossom buds, or combined blossom and growth buds, as in pome fruits. It is essential to choose bud-sticks which have *growth* buds. Such buds can be distinguished by their somewhat flat, or pointed, appearance. Blossom buds are larger and rounder. The buds on new shoots of pome, cherry, walnut, and citrus trees are single, and this also applies generally to European plums. Buds on new wood of apricot, peach, almond, and Japanese plum trees generally consist of one growth bud and one or more blossom-buds, and are termed *multiple buds*. Weak laterals on these latter kinds of trees may produce single buds, and, as these are usually blossom buds, they are useless for budding purposes.

If there is a plentiful supply of buds, it is best to choose only the well-developed ones. These are usually found in the two middle quarters of a mature shoot. The small, "blind" buds towards the basal end and the immature buds at the tip of a deciduous shoot, should be cut off and discarded. In citrus, the immature buds occur on angular wood, and, together with "blind" and thorny buds, should not be used by the beginner. Citrus bud-sticks should be chosen from rounded, mature, one-year-old wood about the thickness of an ordinary lead pencil (Fig. 10). Deciduous or citrus buds which have commenced to grow cannot be used successfully in budding.

As soon as possible after removing the bud-sticks from the parent tree, the leaves are cut off to prevent loss of moisture. It is advisable to leave a small portion of each leaf-stalk (petiole) attached, to facilitate handling the bud, and to protect it during insertion and tying. The bud-sticks are then bundled, labelled, and if not required for immediate use, the basal ends are stood in about an inch of water in a cool place. Alternatively the bud-sticks may be wrapped in wet hessian.

Fig. 10—Suitable and unsuitable citrus bud-sticks.

Unsuitable—(*a* and *b*), young angular wood; (*c*), thorny buds; and (*f*), wood too old and buds becoming "blind".

Suitable—(*d* and *e*), well rounded, mature wood with plump, vigorous buds.

Transport and Storage of Bud-Sticks.

For transport involving any period up to two days, large quantities of bud-sticks may be packed in boxes lined with wet paper. Smaller bundles survive quite well, for a short period, if wrapped in wet paper or damp sphagnum moss and then enclosed in a moisture-proof outer wrapping. They should be kept cool as well as moist.

When the period of transport is longer, the bud-sticks should be dipped quickly in melted paraffin wax (melting point 127°F.) and packed in damp sphagnum moss in moisture-proof paper or boxes. To prevent burning the bark, the wax should be melted in a tin in a suitable container of hot water. Packages forwarded by rail should be marked "perishable."

On receipt of bud-sticks they should be unwrapped immediately and the basal ends placed in water, or kept cool and moist by covering with wet hessian. If the bud-sticks have been waxed, the basal ends should be re-cut and stood in a little water. They should be kept in a cool place, and used as soon as possible. After several days, the leaf-stalks fall off the bud-sticks. This does not affect the viability of the buds, but makes them slightly more difficult to handle and more liable to injury during handling and tying.

Preparation of the Stock.

If the weather has been dry for some time before the budding period, it is advisable to irrigate the stocks—whether young seedlings or established trees—two or three weeks before the actual budding operation, to ensure that the bark will lift freely and subsequent healing take place.

A little preparation of the actual part of each stock to be budded will greatly facilitate later operations. Some care in its selection is necessary. One or two-year-old plants, as in nursery propagation, may be budded at any desired height. In the case of re-working established trees, it is advisable not to bud wood which is more than two years old. Buds take best on shoots less than two years old. It is usual to remove the leaves and all lateral growth around the budding site on the selected shoot. In citrus, thorns also should be removed.

BUDDING OPERATION—DECIDUOUS TREES.

As the scion, and consequently its moisture reserve, are small, it is essential that the

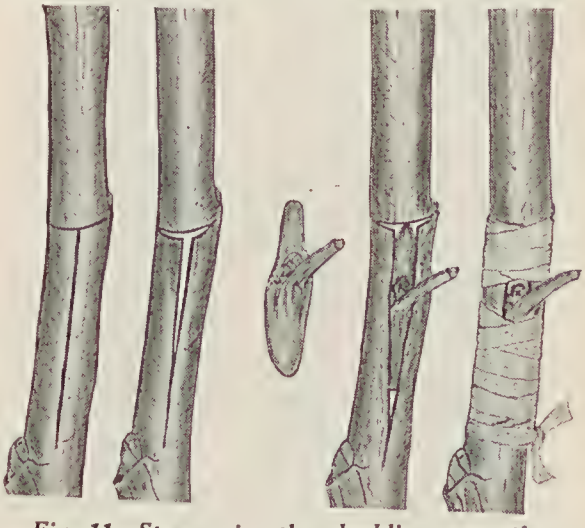

Fig. 11—Stages in the budding operation for deciduous trees. From left to right, "T" cut on stock; flaps of bark raised; the bud; the bud inserted; tying completed.

Fig. 12—Two methods of cutting the bud from the bud-stick. The recommended method is shown on the left.

operation be completed as quickly as possible to prevent its drying out. The stock should be cut first.

(*a*) **Cutting the Stock.**—On a round, smooth portion of a shoot of the stock a longitudinal cut, about 1½ inches long, is made with the budding knife. Across the top of this cut, another cut is made approximately at right angles to it. This, with the previous cut, forms a "T" on the bark of the stock (Fig. 11). Both cuts should be deep enough to penetrate to the wood beneath the bark. If the latter cut is made with a bowing and skidding action of the knife, the two flaps of bark will be partly raised. If necessary, they can be further separated from the wood by sliding the special provision on the handle or blade of the budding knife beneath the bark.

(*b*) **Cutting the Bud.**—In Fig. 12. two methods of cutting the bud from the bud-stick are shown. In the first method the bud-stick is held firmly by the thumb and first and second fingers of the operator's left hand, the second finger supporting the bud-stick on the opposite side from the bud which is to be removed. The basal end of the bud-stick points away from the operator. The bud with its shield of bark and wood is cut from the bud-stick by commencing about ½ inch on the far side of the bud and finishing about ½ inch on the near side of the bud. The bud should be cut deeply enough to remove only a thin slice of wood. The thumb of the right hand is pressed against the second finger of the left hand during the actual cutting. As the knife passes beneath the bud the thumb of the left hand is brought down and holds the partly-severed bud against the bud-stick. After a little practice, this method is very easy and will appeal to budders because there is less danger of dropping the bud, or cutting the thumb, than in the alternative method.

In the second method, the action of the knife in cutting the bud is the same as in the first method, and the same type of bud is removed; but it is more difficult to avoid dropping the bud, and with beginners there is a risk of cutting the thumb. The bud-stick is held in the left hand, and the first finger supports it beneath the bud to be cut. The thumb of the right hand is above the bud-stick just near the spot where the knife emerges from under the shield of bark.

When the bud is cut by either of these methods a long, oval, shield-shaped piece of wood and bark is also cut from the bud-stick and remains attached to the bud (Fig. 13). It is advisable to remove the wood by gentle pressure on the sides of the bark above the actual bud. To do this, the bud is held between the thumb and first finger and flicked on the end of the shield by a finger of the other hand. This will loosen the wood which then can be removed easily. If a small piece of wood still remains on the bud, it should be removed with the budding knife. Care must be taken not to injure the bud itself when removing the wood. When

Fig. 13—Citrus buds cut from the bud-stick. (*a* and *b*), front view of suitable buds; (*c*), rear view showing woody tissue and small margin of cambial layer; (*d*), rear view showing shield of wood; (*e*), removed and exposed cambial surface.

it is removed from buds of some varieties of apricot and occasionally from citrus buds, the central tissue of the bud itself pulls out. Such buds die. If it occurs often, a very thin shield should be cut instead of the normal thick one, and the wood left in it. The wood also may be allowed to remain, preferably in a thinner shield than normal, if the bud-sticks of other kinds of fruit are not in good condition and the wood is difficult to remove from the bud.

(*c*) **Inserting the Bud.**—The bud is held between the thumb and fore-finger and slipped beneath the raised flaps of bark on the stock so that it lies evenly along the wood with the petiole and bud itself projecting through the longitudinal cut. The bud should be inserted the right way up (petiole below the bud) and the petiole is used to slip the bud along beneath the bark. If the bark of the bud overlaps the top of the "T" cut, the overlapping part is cut off so that the remainder will lie closely against the wood of the stock.

(*d*) **Tying.**—Careful tying or binding of the bud is very important. Its objects are to hold the bud firmly in position and to prevent drying out of the tissues until union occurs. It also prevents water entering the wound.

Natural raffia is the most suitable material to use for tying. Before commencing to bud, the raffia is cut into lengths of about 15 inches and tied in small bundles. It is then moistened and wrapped in damp hessian to make it pliable. Wet raffia should not be used for tying. Thin strands are better than thick ones.

There are two methods of tying. In the first method, the raffia is held near the middle and both ends are wrapped simultaneously around the bud and the stock commencing at the base of the cut and finishing above the top of the "T" cut with a reef knot. In the other method, a single strand wrap is made by commencing at the bottom and overlapping one short end, and continuing the wrap with the long free end until the cut is covered. One or two half hitches are used to secure this free end.

Firm binding is necessary. *Care should be taken not to draw the raffia across the point of the bud.* See Figs. 11 and 14.

(*e*) **Removing the Tie.**—Usually, about three weeks after budding, stock and scion have united, and the tie can be cut on the opposite side to the bud. Gentle pressure with a sharp knife on the top and bottom strands of the raffia is all that is required to cut the tie. If the cutting of the tie is delayed for too long, and the stock continues to grow, the bark and the bud will be injured.

Spring Budding—Deciduous.

In Victoria, spring budding of deciduous trees is not practised extensively, being confined mainly to the stone fruits. It differs from dormant budding in that the bud-sticks are cut in late winter from the dormant tree and must be stored until the stock commences to grow. The shield of wood in the bud cannot be removed easily and therefore it is necessary to cut a thin bud, i.e., with very little of the underlying wood attached. The bud unites with the stock and commences to grow in a few weeks.

Budding—Citrus Trees.

Citrus can be budded in exactly the same way as deciduous trees, but frequently the inverted "T" (⊥) cut is used (Fig. 14). When this method is adopted the bud is inserted from below and pushed up under the two flaps of bark. It is claimed that this latter method is more successful if wet weather follows budding. Citrus buds have a tendency to slip out when being tied, and to overcome this, tying is commenced either a little below the cross cut if the inverted "T" (⊥) cut is used, or just above, if the "T" cut is used.

Fig. 14—Stages in the citrus budding operation.
(*a*), Inverted "T" ("⊥") cut on stock with flaps of bark raised; (*b*), bud inserted; (*c*), bud tied with raffia.

Fig. 15—Shoot pruned back to stub; growth from inserted bud; and method of supporting growth on a re-worked tree. Note:—Branching has been induced in new growth by topping it.

Either dormant or spring budding may be used for citrus. For spring budding, the bud-sticks are cut from the growing tree just before use and must be treated in the same manner as bud-sticks in dormant budding. The shield of wood can be removed easily from the bud.

Treatment after Budding.

The bud is usually inserted near the base of a shoot and it is necessary to remove the part of the shoot above the bud to ensure that the bud will grow. In summer and autumn (dormant) budding of deciduous and citrus trees, the stock is cut off just above the bud in late winter or early spring. In spring budding, the top of the stock should be removed about 6 inches above the bud at the time the raffia is cut. In both cases, all shoots arising from the stock, other than the one from the bud, should be rubbed off before they reach 1 inch long.

In nursery practice, soon after the bud commences to grow, side growths will arise from the new shoot and these should be pulled off while they are small, care being taken not to remove the leaves from the main shoot. About five of the later side growths, which arise near the heading height, should be retained to form the head of the tree. The main shoot from the inserted bud should be allowed to extend until it is about 6 inches above the height at which it is desired to form the head or crotch. It should then be topped back to the side growths.

The 6-in. stub left above the spring bud is used to support the shoot as in Fig. 15. This support is necessary because the tissues holding the bud to the stock are not yet strong enough to resist wind. This stub need not be removed until several months later.

GRAFTING.

No fundamental distinction exists between budding and grafting. In the former, the scion consists of one bud, whereas in the latter it is a short twig with more than one bud and is called a *grafting scion,* or simply a *scion* (see definitions in first instalment of this article). A bud is simply slipped under the bark to make contact with the wood. In some forms of grafting, the scion is actually inserted into and held in position by the *wood* of the stock, although provision is made at the same time for contact between the cambial regions of the scion and stock. In other forms, the scion is forced between the wood and the *bark,* and the cambial layers automatically contact, the scion being specially prepared for this

Fig. 16—Vigorous growth of a young apple tree after top-working.

Fig. 17—A 31 years old sweet orange seedling top-worked three years ago by budding on to new growth. The marks on trunk are caused by whitewash.

Fig. 19—Large wounds allowed entry of this wood-rotting fungus.

purpose. In budding, it is preferable to bud on to a part of the stock with thin bark, i.e., young wood. In grafting, the age and the size of the grafted part of the stock are immaterial, because of the many methods of grafting available. A list of the methods of grafting used in Victoria has been given in the first instalment of this article, and each method will be described later under one of the headings—**Top-working** or **Frame-working.**

Re-working.

The term "re-working" is used to describe the changing of the variety of a tree by budding or grafting. There are several reasons

Fig. 18—A cherry tree top-worked by means of whip-tongue grafts when the limbs were small.

why re-working should occupy an important place in Victorian horticulture. For some years past, the Commonwealth Government, at the request of the various State Governments, has been reducing the number of varieties of apples and pears permitted to be exported. The varieties eliminated are either of poor quality and therefore unpopular with the public, or their storage life is too short. Then, too, new varieties, of all kinds of fruit, with more desirable characteristics, are introduced from time to time, and older varieties are displaced from favour. In other cases, some

varieties have been planted and later it has been discovered that the environment does not suit them.

When the re-working process entails the removal of most of the top part of a tree (stock) it is called **Top-working.** If all, or nearly all, of the branch system of the tree is retained, the method is called **Frame-working.**

The main advantages of top-working are that it is simple, quick, and the actual cost of the operation is small. This method is satisfactory on pome fruit trees up to about eight years old (Fig. 16), and for stone fruit and citrus trees up to any age (Figs. 17 and 18).

The disadvantages in the case of older trees are that almost the entire frame-work of the tree is lost and must be re-grown. It has been observed that old trees, after top-working, seldom attain their former size, even after a long period. In many varieties the crop is lost for at least five years, and the tree may never yield crops as heavy as those obtained prior to top-working. When top-worked apple, pear, and citrus trees do re-commence to crop, the quality of the fruit will be inferior and have poor keeping qualities for several years. In many districts in Victoria, there is a real danger of the large wounds, associated with this method of re-working, becoming infected with wood-rotting fungi, such as *Polystictus,* Silver-leaf (*Stereum*), and *Schizophyllum,* which ultimately destroy the tree.

Frame-working, on the other hand, largely overcomes the above disadvantages of top-working, while its chief drawbacks are the initial cost of the operation and the scarcity of skilled labour to do the work. The earlier and heavier cropping of the trees, and the better quality of the fruit, however, usually more than offset the initial cost of this method. It is unsuitable for stone fruit trees.

Frequently, a combination of top-working and frame-working is used, the large wounds being avoided by top-working as high as possible in the tree and adopting frame-work grafts for the lower portions of the branches.

Methods of Re-working Various Kinds of Fruit Trees.

Recommended Methods are shown in italics.

Tree.	Young Trees (less than 8 years).	Old Trees.
Apple, Pear, Quince	*Top-work*— *Strap*, Bark, Cleft, and on small limbs, Whip-tongue	*Frame-work*— Bark Grafts—*Gouge*, "L", "⊥", and Needle. Stub Grafts—*Whip-tongue*, Side-Cleft, Bark and Mid-split Cleft. *Bud in Lateral*
Peach, Plum, Apricot, Cherry, Almond, Walnut	*Top-work*— *Bud* into new growth. Bark Grafts. NOTE.–Cherries and plums can be Whip-tongue grafted, if limbs are small enough. A Flute bud is used for the Walnut	*Top-work*— *Bud* into new growth. Bark Grafts NOTE:—Bark grafts are recommended for Walnuts
Citrus	*Top-work*— *Bud* into new growth	*Top-work*— *Bud* into new growth
Fig	*Top-work*— *Bark Graft* } Use two-year-old wood for Cleft Graft } scions	*Top-work*— *Bark Graft* } Use two-year-old wood for Cleft Graft } scions
Olive	*Top-Work*— *Bark* Grafts—at or just below soil level Whip-tongue—at or just below soil level	*Top-work*— *Bark* Grafts—at or just below soil level
Persimmon	*Top-work*— *Bud* into new growth. Whip-tongue graft may be used on small limbs at or just below soil level	*Top-work*— *Bud* into new growth Bark grafts

The foregoing is the second instalment of an article dealing with the subjects of Budding, Grafting, and Methods of Re-working Fruit Trees. A further instalment will appear in a subsequent issue of this Journal.

Live Stock Notes

Reminders for August—September

Compiled by A. C. T. HEWITT, M.Agr.Sc., Live Stock Science Officer

The Value of Pastures.

PASTURE is the most important farm crop. It supplies the bulk of stock food in Victoria and the dairying, beef, wool, mutton, and fat lamb industries are, to a great extent, dependent upon it. When properly managed it supplies one of the most nutritious and cheapest of fodders.

The cost of pasturage depends upon such factors as the value of the land upon which it is grown, the suitability of the land (and district) for pasture growth, and its general management.

On the irrigation settlement at Werribee an acre of pasture yields approximately 20 tons of green feed per annum and costs not more than £5 per year to maintain. This maintenance cost is made up as follows:—

Five per cent. interest on the capital value of the land, without buildings, at £50 per acre (£2 10s.); irrigation water, 2 acre-feet at 12s. per acre-foot (£1 4s.); superphosphate, 1 bag per acre (10s.); rates per acre (6s.); and labour cost of irrigating, top-dressing, repairing fences, &c. (10s.). Total—£5.

In every 100 lb. of pasture there are 14 lb. of nutrients (starch equivalents). In 20 tons, there are, therefore, 6,272 lb. of nutrients (starch equivalents) which cost £5. This works out at 2d.—or one-fifth of a penny per pound of starch equivalent.

There is evidence to show that pasturage, growing on land worth £20 per acre, without buildings, in 30-in. to 35-in. rainfall areas, is being produced at less than half the cost of Werribee pasture, the nutrients therefore costing less than one-tenth of a penny per pound.

At the present time, the nutrients (starch equivalents) in the cheapest purchasable fodders which include pollard, polly feed, maize oil meal, oat and barley branning, rice meal, meat meal, &c., are costing fully 1d. per pound and are, therefore, five to ten times more costly than pasture. For example, in 2,000 lb. of pollard, there are 1,380 lb. of starch equivalents which cost 1,440d. (£6), and each pound of starch equivalent costs 1.05d.

Chaff, bran, linseed meal, and a number of other fodders are much dearer, costing from

1½d. to 2d. per pound of starch equivalent and therefore are up to twenty times dearer than pasture.

Food for the leaner periods of the year should be conserved as hay or silage from the surplus spring growth of pastures, and from cereal hay or grain and green fodder crops, such as maize, sorghum, millet, and oats. Mangolds and other root crops also may be grown and stored for feeding when fodder is scarce. Such home-grown supplementary fodders can usually be produced at a cost midway between the cost of pasturage and the cheapest purchasable fodders. Thus, the nutrients in home-grown hay, silage, grain, or green fodder crops cost, on the average, about ½d. per pound.

Along with pasture, these supplementary fodders should be exploited to the fullest extent, and any deficiencies then required to supply more nutrients or to balance the ration should be made up by purchasing the cheapest available fodder.

Dairy Cattle.

Since the outbreak of war, the dairying industry has enjoyed a relatively prosperous time. Apart from labour shortages and the increased cost of some essentials, dairy farmers have had little to worry about. There are indications, however, that 1941-42 will be a difficult year because of less shipping space being available for butter.

According to the Commonwealth Equilization Committee, butter, before the war, was, on the average, held in storage for one and a half weeks only prior to shipment. During the first year of the war it remained two and a half weeks in storage and three and a half weeks last year. During the coming year, it will probably be held for an even longer period and this, coupled with the fact that the voyage to England takes longer, calls for better quality butter, and better cream from which to make it.

It is expected that shipping space will be available for all the cheese and condensed and dried milk we are able to export, but the increased production of these commodities will have only a very small effect on the total quantity of butter produced.

If butter is to keep for long periods it must be not only hygienically made, but manufactured from high-grade cream. Farmers, therefore, as a safeguard to themselves and their industry, must be particularly careful to produce the choicest cream from healthy cows. To do this, hygiene in all matters pertaining to the dairy should be scrupulously practised.

Sheep.

A new revised edition of the Sheep Industry Bulletin has been published by the Department, and is available on application to the Director, Department of Agriculture, Melbourne, C.2, at a cost of 1s., post free.

There are chapters dealing with the selection of ewes and rams, breeds of sheep, wool classing, fat lamb production, feeding of sheep, sheep dipping, &c., and a comprehensive section on the various sheep diseases, such as entero-toxaemia, fluke, worms, &c., is included. In addition, practical instruction is given for the construction of a home-made wool press, concrete fencing posts, sheep dips, drafting yards, and self-feeders.

Poultry.

Rearing Chickens.

To rear good chickens, it is not only necessary to supply them with liberal quantities of good food, but they must have suitable conditions and environment also. Given these, quick growth and good development will result, with higher egg production from the pullets, and better prices for cockerels.

The value of the portable colony-house system for rearing chickens is not fully realized by a large number of poultry keepers; if it were better understood, it would be far more extensively adopted. This system is economical in regard to accommodation, labour, and food. After leaving the brooders, chickens reared in this way thrive much better than those confined in small bare yards, when the ground gradually becomes contaminated. After a few days under these confined conditions, the chickens become weary, and do not run about as they would in larger, cleaner yards. By keeping the birds moving about, they will retain good health and develop properly.

Portability, adaptability to weather conditions, low cost, and simple construction are the features of the colony poultry house. These houses have been used by a great number of poultry breeders for many years with highly satisfactory results. The dimensions of an extensively used type of portable colony house are 6 feet x 5 feet x 4 feet high. The houses are built tent-shape, and are covered with waterproof material. The ridge or roof

pole should be longer than the house, in order to provide a good hand-hold for shifting the house about. A house of this size will accommodate 50 chickens, ten or twelve weeks old, for six to eight weeks, when the number should be thinned down by the removal of the most forward pullets to permanent laying sheds. A frame of 2-in. x 1-in. battens on edge, and covered with tightly stretched wire netting is desirable on the floors of the colony houses, and it should fit neatly inside the bottom of the house. The advantages of this frame are that the birds will always have a dry place to stand upon. It also prevents loss from smothering, because even if the chickens do heap up, those underneath get sufficient air from below through the meshes.

It is seldom, even on a large farm, that a great number of chickens are put out at one time; therefore, a few hurdles are sufficient to keep the birds confined to the areas round the pens for two or three days. Five hurdles made of 2-in. by 1-in. hardwood, 10 feet long and 3 feet high, covered with wire netting, should be enough for one house.

After two or three days the chickens will be accustomed to their new house, and the hurdles may be removed. The young birds from the various houses mingle during the day, especially at feeding time, and at roosting time they will return to their respective houses. The houses should be kept some distance apart, and not moved too far at one time (a few feet is sufficient), otherwise there is a danger of the birds not going to their own house in its new position.

[H. F. Clinton, Poultry Expert.]

Horses.

The present restrictions on the use of petrol have created an increasing demand for young, active draught and delivery horses, and the market for such horses is now showing an upward tendency.

Hand feeding is very necessary where pastures are poor. If available, small quantities of lucerne chaff can be advantageously added to shandy or oaten chaff, as such mixed chaff makes a better food than either lucerne or cereal chaff fed separately.

Stallions being used for stud work should be liberally fed, well-groomed, and well exercised.

[W. D. Shew, B.V.Sc., G.M.V.C., Senior Veterinary Officer.]

Bees.

Advantage should be taken of fine weather to open and inspect all hives to ascertain if breeding has commenced. It should be noted also whether there are sufficient reserves of food, whether the comb is healthy, and whether the hives are dry and weatherproof. All damp mats and mouldy combs should be removed and replaced with fittings in keeping with the requirements of the colonies.

Breeding should have commenced, and for this function increased food is required. Where there is a possibility of a food shortage occurring before a natural flow of nectar is available, the bees should be hand-fed. This will ensure a strong force of worker bees for gathering honey later in the season.

All grass should be removed from hive entrances and the lids made secure and weathertight.

[J. W. Thomlinson, Apiary Inspector.]

Pigs.

Mineral Supplements.

Growing pigs receiving 2 gallons or more of separated milk per day will obtain all the phosphate and lime they require from the milk.

As the milk supply falls and grain or cereal meal is used in increasing quantities, the pigs will receive sufficient phosphate from the cereals, but they will suffer from lime deficiency unless it is supplied in another form.

Lime deficiency may cause slow growth and predispose pigs to further trouble.

To supplement a pig's diet composed largely of cereal grains or meals, a mixture of four parts of ground limestone and one part salt should be fed at the rate of 1 oz. per pig daily to growing pigs, from weaner stage onwards, and to dry sows. The supplement should be increased to 2 oz. per day for sows with litters.

When the milk supply is below three-quarters of a gallon daily per pig, it is desirable to use some protein-rich substitute such as meatmeal with the cereals or other foods, except when good quality pasture is available, when half a gallon of separated milk may be considered the minimum quantity daily to provide the necessary protein supplement to cereal grains or meals.

[L. A. Downey, H.D.A., Pig Expert.]

POULTRY FEEDING TESTS, 1939-40

Results at Werribee

By W. O. PEDERICK and A. G. CLARK

EXTENDING over a period of twelve months from the 1st April, 1940, to the 31st March, 1941, poultry-feeding tests were conducted at the State Research Farm, Werribee. Five hundred pullets hatched during August and September, 1939, were used. These consisted of five pens of Australorps with 50 birds in each pen, and five of White Leghorns, similarly divided. All the birds were kept confined, i.e., there was no outside run, although succulent green food was supplied daily and shell grit was always available.

The object was to demonstrate whether dried brewers' grains could be used as a substitute for bran, and whether crushed grain could be used as a substitute for pollard. The tests were made because of the shortage of bran and pollard at the time.

Bran and pollard, which are by-products of the flour mill and in normal times are cheaper than crushed grain, have proved to be a satisfactory basis for all poultry mashes, whether wet or dry. On analysis, dried brewers' grains compare favorably with bran, and also, like bran, when used with crushed grain in a wet mash, prevent the mixture from becoming doughy or sticky.

All meals were fed as dry mash which was always available to the birds. The grain mixture, which consisted of six parts (by weight) of wheat, two parts oats, two parts maize, and one part barley, was fed in the litter each afternoon at the rate of 6½ lb. per pen (approximately 2 oz. per bird).

The accompanying feeding table on page 400 gives particulars of the food consumed excluding the greenstuff; the eggs laid and their value, the return over food cost, and the mortality in each pen. Dead birds were replaced. The cost of food was arrived at by taking the wholesale prices published in the daily press without allowing for the cost of delivery, and all the eggs laid were valued at wholesale "hen" egg prices. No deductions have been made for marketing charges, &c.

Results.

The egg production in all pens was consistently good and ranged from 171 eggs per

bird in the lowest pen to 198 eggs in the highest pen, with an average of 185 eggs per bird.

Both the monetary returns over food cost and the average egg production per bird from the pens receiving brewers' grains were lower than from those receiving bran as shown in Table I.

The birds receiving dried brewers' grains ate their mash readily, this being an important factor in dry mash feeding, but partly on account of the higher cost of the mash and partly on account of the fewer eggs laid, the monetary return over food cost was 1s. 7d. per bird below that in the pens receiving bran, and 3s. 4d. per bird below that in the pens receiving the control mash. However, dried brewers' grains can be used to replace bran, as reasonably good returns were received from the pens receiving it.

It will be noted from Table II. that with both Australorps and White Leghorns the highest monetary returns over food costs were recorded in the pens receiving the ordinary mash, consisting of 30 per cent. bran, 60 per cent. pollard, and 10 per cent. meat meal; namely, pens 5 and 6. This is a very plain mash which appears to lack variety, but the variety is provided in the grain mixture which consists of four different grains—wheat, oats, maize, and barley. The egg production is not so high in these pens as in some of the others, but as the cost of feeding was lower the return over food cost was higher.

These annual feeding tests enable a comparison to be made between Australorps and White Leghorns. This year the average amount of food consumed was 96 lb. per bird by the Australorps and 103 lb. by the White Leghorns, and the egg production was 191 and 180 eggs per bird respectively. Table III shows the average monthly production of each breed.

Conclusions.

From these tests it would appear that dried brewers' grains and crushed grain can be substituted for bran and pollard respectively, and could be used to replace them wholly or in part when prices permit, or when bran and pollard are unprocurable.

Many farmers who grow their own grain and have a crusher on the farm would find it more economical and profitable to use crushed grain than pollard, especially as the difference between the cost of purchased food landed on the farm and the price received on the farm for grain sold would be saved.

Under the conditions of this test where mixed grain was fed in the litter, the pens receiving crushed wheat only as a substitute for pollard did as well as those receiving a mixture of crushed wheat, crushed oats, and crushed barley.

TABLE I.—COMPARISON BETWEEN INDIVIDUAL PENS RECEIVING BRAN AND DRIED BREWERS' GRAINS.

Pens Receiving Bran.			Pens Receiving Dried Brewers' Grains.		
Pen Number.	Average Number of Eggs Laid per Bird.	Return over Food Cost.	Pen Number.	Average Number of Eggs Laid per Bird.	Return over Food Cost.
		s. d.			*s. d.*
2 ..	184·6	12 9	1 ..	191·9	12 2
4 ..	198·5	13 9	3 ..	194·2	12 7
7 ..	171·1	10 4	8 ..	175·0	9 1
9 ..	198·1	12 3	10 ..	170·6	9 0
Average	188·1	12 3	Average	182·9	10 8

TABLE II.—AVERAGE EGG YIELDS AND RETURNS OVER FOOD COSTS FOR THE DIFFERENT FEEDS.

Kind of Mash.	Number of Pens.	Average Number of Eggs.	Return over Food Cost.
			s. d.
Bran, Pollard, and 10 per cent. Meatmeal	2	186·2	14 0
Bran, Crushed Grain, 15 per cent. Meatmeal, and 10 per cent. Dried Buttermilk	4	188·1	12 3
Dried Brewers' Grains, Crushed Grain, 15 per cent. Meatmeal, and 10 per cent. Dried Buttermilk	4	182·9	10 8

TABLE III.—AVERAGE MONTHLY PRODUCTION OF 250 AUSTRALORPS AND 250 WHITE LEGHORNS (1940-41).

Month.	Australorps.	White Leghorns.
	Eggs Per Bird.	Eggs Per Bird.
April	12·1	13·5
May	15·9	12·5
June	15·4	11·2
July	14·8	12·5
August	18·2	15·0
September	20·6	18·1
October	20·5	19·8
November	17·5	18·1
December	15·8	17·3
January	15·2	16·1
February	13·0	13·4
March	12·2	12·5
Average per bird for twelve months	191·2	180·0

Test No. 21—Werribee Feed Tests, 1st April, 1940, to 31st March, 1941 (12 months).

Pen No.	50 Birds per Pen.	No. of Birds Died.	Bran.	Pollard.	Dry Brewers' Grain.	Crushed Wheat.	Crushed Oats.	Crushed Barley.	Meat Meal.	Dried Butter-milk.	Wheat.	Oats.	Maize.	Barley.	Total Food.	Cost of Food.	Eggs Laid.	Value of Eggs.	Return over Food Cost.
		No.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	£ s. d.	No.	£ s. d.	£ s. d.
1	Australorps—Dry mash	5	..	..	232	1,506	..	..	347	232	1,295	431	431	215	4,689	20 10 3	9,231	50 16 4	30 6 1
	Average	..	..	..	..	..	..	..	..	..	..	..	..	..	**93·7**	**0 8 2**	**184·6**	**1 0 4**	**0 12 2**
2	Australorps—Dry mash	4	249	..	..	1,616	..	..	373	249	1,295	431	431	215	4,859	21 5 9	9,595	53 3 3	31 17 6
	Average	..	..	..	..	..	..	..	..	..	..	..	..	..	**97·2**	**0 8 6**	**191·9**	**1 1 3**	**0 12 9**
3	Australorps—Dry mash	4	..	..	276	597	597	597	414	276	1,295	431	431	215	5,129	22 14 4	9,712	54 1 10	31 7 6
	Average	..	..	..	..	..	..	..	..	..	..	..	..	..	**102·5**	**0 9 1**	**194·2**	**1 1 8**	**0 12 7**
4	Australorps—Dry mash	3	237	..	..	514	514	514	356	237	1,295	431	431	215	4,744	20 14 7	9,924	55 5 11	34 11 4
	Average	..	..	..	..	..	..	..	..	..	..	..	..	..	**94·9**	**0 8 4**	**198·5**	**1 2 1**	**0 13 9**
5	Australorps—Dry mash	5	689	1,379	..	..	..	..	230	..	1,295	431	431	215	4,670	16 10 1	9,351	51 7 0	34 16 11
	Average	..	..	..	..	..	..	..	..	..	..	..	..	..	**93·4**	**0 6 7**	**187·0**	**1 0 6**	**0 13 11**
6	White Leghorns—Dry mash	6	672	1,344	..	..	..	..	224	..	1,295	431	431	215	4,612	16 6 4	9,272	51 11 11	35 5 7
	Average	..	..	..	..	..	..	..	..	..	..	..	..	..	**92·2**	**0 6 6**	**185·4**	**1 0 8**	**0 14 2**
7	White Leghorns—Dry mash	6	255	..	..	553	553	553	384	255	1,295	431	431	215	4,925	21 12 0	8,554	47 11 6	25 19 6
	Average	..	..	..	..	..	..	..	..	..	..	..	..	..	**98·5**	**0 8 8**	**171·1**	**0 19 0**	**0 10 4**
8	White Leghorns—Dry mash	7	..	..	342	742	742	742	514	342	1,295	431	431	215	5,796	25 19 8	8,749	48 13 10	22 14 2
	Average	..	..	..	..	..	..	..	..	..	..	..	..	..	**115·9**	**0 10 5**	**175·0**	**0 19 6**	**0 9 1**
9	White Leghorns—Dry mash	4	281	..	..	1,828	..	..	422	281	1,295	431	431	215	5,184	22 17 1	9,907	53 12 0	30 14 11
	Average	..	..	..	..	..	..	..	..	..	..	..	..	..	**103·7**	**0 9 2**	**198·1**	**1 1 5**	**0 12 3**
10	White Leghorns—Dry mash	7	..	..	292	1,896	..	..	437	292	1,295	431	431	215	5,289	23 9 9	8,530	46 0 11	22 11 2
	Average	..	..	..	..	..	..	..	..	..	..	..	..	..	**105·7**	**0 9 5**	**170·6**	**0 18 5**	**0 9 0**
	Total—500 birds	51	..	..	..	..	..	..	..	..	..	..	..	..	49,897	211 19 10	92,825	512 4 6	300 5 8
	Average	..	..	..	..	..	..	..	..	..	..	..	..	..	**99·8**	**0 8 6**	**185·6**	**1 0 6**	**0 12 0**

Notes.—Average price of eggs, 1s. 4d. per dozen. Food cost per dozen eggs, 6·6 pence. Food consumed per egg laid, 8·6 oz. Food consumed per bird per day, 4·4 oz. Cost of food per bird per week, 2d.

The Selection and Maintenance of Starter Cultures for Cheesemaking

1.—Function of Starter in Cheesemaking and Types of Starter Available

By T. M. JENSEN, B.Agr.Sc. (N.Z.), Principal, School of Dairy Technology, Werribee

OWING to the likelihood of difficulties arising in connexion with the export of large quantities of butter due to lack of refrigerated vessels and in view also of an expressed desire by Great Britain for larger quantities of cheese, the prospects are for a rapid extension of the cheesemaking industry in this country. With the rapid development that is likely to take place it is important that quality aspects should not be neglected. Given a milk supply that is suitable for cheesemaking and a cheesemaker who knows his job, the most potent single factor influencing the quality of cheese is the starter. Much new knowledge has recently been brought to light by research workers regarding the selection and maintenance of cheese starters and it is the object of this series of articles to present the latest information on the subject in a concise manner for the benefit of the practical cheesemaker.

Requirements in a Good Cheese Starter.

The chief, and perhaps the only purpose of using a starter in cheddar cheesemaking is to ensure the regular development of acid in the milk and curd throughout the manufacturing process. In effect, therefore, the efforts made by the cheesemaker to maintain a good starter are essentially attempts to so control the starter bacteria that acid will be produced during the cheesemaking process in the manner required for the production of good cheese. The chief difficulties encountered with starters are, firstly, to obtain a culture that will produce acid actively enough under the conditions obtaining in the cheese-vat (especially when it is desired to employ high cooking temperatures) and, secondly, to maintain uniform vitality or acid-producing power in the cheese-vat from day to day. The latter is essential if standardization of the manufacturing technique leading to uniformity in quality of output is to be secured.

The view that the starter, in addition to producing the acid necessary for manufacture, is largely responsible for the development of flavour in the cheese during the subsequent ripening process, is one that has been, and still is, commonly held by cheesemakers. However, as a result of investigations that have been carried out in various parts of the world, considerable doubt has been thrown on this belief, and foremost authorities are now of the opinion that the organisms responsible for the production of flavour in cheese arise not from the starter itself but from other sources. The only part played by the starter in-so-far as the flavour of the cheese is concerned is said to be an indirect one depending on the influence of acidity on the growth of the cheese-ripening bacteria. It has been definitely established that the starter bacteria die out in the cheese shortly after it is placed on the shelves and long before the flavour has started to develop. They are succeeded by other types of organisms which later produce the flavour. This leads to the conclusion that the sole function of the starter in cheesemaking is acid production.

In the past, the cheesemaking properties of starters have been judged chiefly on the basis of flavour, the assumption being that a starter with a good flavour would naturally produce a cheese with a good flavour. It will be now seen, however, that this practice is sound only in-so-far as it assists in the detection of undesirable contamination. With regard to the essential property of the starter, i.e., acid-producing power, flavour affords no reliable guide, and there can be little doubt that many of the small variations in flavour normally encountered between one clean starter and another, and in the same starter from time to time, though often attributed much significance by some cheesemakers, are quite meaningless in this respect.

A good deal of superstition also attaches to many of the other characteristics frequently claimed to be necessary in a good cheese starter. Thus some makers pay great attention to the manner in which the clotted starter breaks up on stirring, a smooth oily texture usually being regarded as a good omen. Others again pin their judgment to the extent to which the starter has wheyed-off when ready for use, while still others attach considerable significance to small variations in the acidity and various other properties of the ripe starter. Many of these ideas have no scientific basis whatever and often serve only to confuse the real issue, which is constancy in acid-producing power. Unless the starter is quite obviously abnormal in some respect the only reliable method of testing its acid-producing power and therefore its suitability for cheese-making is by actual trial in the cheese-vat or by the vitality test worked out by Whitehead and co-workers (1) or some modification of the same test.

Types of Starter Available.

At this stage it will be advisable to consider briefly what exactly constitutes a cheese starter. Simply stated, it is a culture, usually in milk, of certain lactic acid bacteria suitable for the production of acid in milk and curd during the cheesemaking process. There are many kinds of bacteria capable of producing acid when grown in milk, but only a certain class or group of organisms known as the True Lactic Acid Bacteria are suitable for use in dairy starters. Although, in the widest sense, the inhabitants of all dairy starters belong to this group, there are, within the group again, a number of sub-groups or families between which there is considerable variation in properties. Thus a commonly recognized classification divides the True Lactic Acid Bacteria into two families, namely, the Lactic Streptococci and the Lacto-Bacilli. The organisms concerned in starter-making belong to the Lactic Streptococci group which comprises a large number of closely related strains. The various strains may be, for the sake of analogy, regarded somewhat as cousins; they are all related, but vary somewhat in shape and in the reactions which they produce when growing in milk or other media. For example, some grow in pairs, some in long chains; some produce practically nothing but lactic acid, while others, in addition to producing lactic acid, yield small but appreciable quantities of other products, including substances sometimes considered desirable for imparting flavour to butter; others again, cause a malty or caramel flavour in milk, while a few produce considerable quantities of slime. Many other variations also occur.

The ultimate source of these organisms is still unknown, but they seem to be very widespread in nature and milk is such an excellent breeding ground for them that the few inevitably present by chance grow to large numbers if the milk is kept long enough. All the organisms in use in dairy starters must have been obtained originally from sour milk or from butter or cheese prepared from such milk, but at the present time there are three immediate sources from which the dairy factory may obtain starters:—

(1) The so-called "natural" starters obtained by allowing milk to sour.

(2) The powder cultures obtained from abroad.

(3) The selected single-strain cultures supplied by dairy laboratories in this country and in New Zealand.

The quality of the "natural" starter obtained by allowing a sample of milk to sour, is purely a matter of chance, for while a culture of milk-souring bacteria may be readily obtained in this way, other types besides the starter streptococci will usually be present and will render the starter unsuitable for dairy use. The undesirable organisms may die out in their competition with the starter streptococci as the starter is carried from day to day or they may gain the upper hand and produce an evil smelling gassy culture. A large number of attempts may be necessary before a starter containing only desirable organisms is obtained and even then the starter may, for lack of activity or some other reason, fail to produce good cheese.

The powder culture represents a distinct advance on the natural starter. In Europe, the manufacturers have selected and mixed together several strains of starter organisms and have thus eliminated the undesirable organisms. It seems reasonably certain, however, that these starters are produced mainly with the idea of butter manufacture in mind, for they all consist of mixtures of the various strains of starter streptococci, including some of those which produce the flavour sometimes considered desirable in butter. Since the cheesemaker is interested chiefly in the acid-producing power of a starter and not so much in its flavour production this basis of selecting starters may not be the best from a cheesemaking point of view.

Experience has shown that some powder starters do produce acid quite actively in the cheese-vat, and that, provided the cheesemaker is prepared to meet a certain amount of day to day variation in activity with the necessary modifications in manufacture, such starters will often produce, for longer or shorter periods, cheese of excellent quality. Ultimately, however, all mixed-culture starters appear to undergo a change leading to a weakening in their acid-producing powers. When this occurs they must be replaced by more active cultures obtained from some other source. If such a weakened starter is propagated daily it may, after a period of time, regain its activity to a greater or lesser degree, but whether or not it will do so is purely a matter of chance and there is no method of restoring it artificially. The explanation for this gradual loss in activity is probably to be found in the fact that the composition of the population in a mixed bacterial culture is constantly in a state of flux. Variations in the medium in which the organisms are growing, in the temperature, and in other conditions for growth may favour first one strain and then another and so lead to ever-changing proportions between the various strains present. So long as active acid-producing strains predominate the starter works fairly satisfactorily, but as these die out or are overgrown by other strains the starter loses vitality. Mixtures of starter organisms in constantly changing proportions must, therefore, give starter cultures of constantly varying properties, and their use, while leading to satisfactory results for longer or shorter periods, can never give stability in manufacturing technique which alone can give evenness in cheese quality.

For these reasons, attempts have been made in some parts of Australia and in New Zealand to use selected single strain starters of lactic streptococci as cheese starters. At first these attempts were not uniformly successful for some of the single-strain starters which were tried, though they proved active enough in the early stages of manufacture, lost their activity in the later stages of the process, and gave difficulty in reaching the desired final acidity in the vat. This was later found to be due to the fact that many strains of lactic streptococci are markedly inhibited in their later growth by the cooking treatment ordinarily employed in cheddar cheesemaking. When heat-resistant strains capable of withstanding the cooking temperatures without subsequent loss of vitality were found, this difficulty was overcome and the use of single-strain starters for cheese-making proved not only feasible, but in some respects preferable to the use of the best mixed-culture starters. The most important of the advantages accruing from their use were—

(1) They produced acid in the vat actively and at a rate which remained remarkably constant from day to day; and

(2) Having been selected on a basis of heat resistance, they could be relied upon to withstand the range of cooking temperatures employed in cheddar cheese-making without becoming sluggish in activity in the later stages of the process.

There will be no need to emphasize the importance of these features to the experienced cheesemaker.

A peculiar feature later observed with these starters was that some pure strains showed a tendency over a considerable period of time to suffer a gradual loss in activity—while other strains proved to be remarkably stable and could be relied upon to behave true to type almost indefinitely. The weakening of some pure strains in this manner cannot be attributed to the same cause as that already given in the case of mixed cultures, and a point of further interest is that the activity of any weakened pure strain can be easily restored by a special treatment in the laboratory. In most of the laboratories preparing starters of this type, even the stable strains are now "rejuvenated" occasionally as a precaution against any gradual change setting in.

(Further articles on Starter Cultures will appear in subsequent issues of this Journal.)

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In the Orchard

By J. L. PROVAN, B.Agr.Sc., Senior Horticultural Instructor

SINCE the interruption in the olive oil supplies to Australia from Mediterranean countries, the price paid for locally grown olives for the purpose of oil extraction has risen to £14 per ton. This price has stimulated interest in olive growing in the northern irrigation areas. A peculiarity of the olive tree is that it does not succeed well when planted in close formation, and therefore solid block plantings, particularly at close intervals, should be avoided. Olive trees, however, do very well when planted around orchard properties as break-winds. For this purpose, they should be planted about 25 feet apart. Headlands so planted should be cultivated and irrigated. Trees planted in this manner not only provide shelter but also yield quite considerable revenue per annum. Varieties of olives suitable for this purpose are Correggiola and Bouquettier, which are noted for their oil production.

In addition to those required for oil production, a large quantity of olives is needed for pickling, and the best of these varieties are Manzanilla and Sevillano. Some varieties are classified as dual purpose, i.e., they may be used both for oil production and pickling. Varieties so classified are Mission, Verdale, Nevadillo Blanco, and Hardy's Mammoth.

The yield of olive oil varies from 30 to 40 gallons per ton of olives, and the cost of harvesting is approximately three farthings per pound, which is about half the price obtained for the product. Growers who have not provided any break-winds along their headlands should seriously consider planting olive trees for this purpose.

Spray equipment should be overhauled at an early date in readiness for the main spraying season. Costly delays may occur if the proper maintenance is not carried out on engines, pumps, and hoses.

The spray schedules used for the control of shot-hole and scab, curly leaf, and brown rot of stone fruits are preventive in character, and, therefore, must be applied before infection of new tissue occurs. This is the reason why it is essential to spray peach and apricot trees at the "pink-bud" stage of the blossom, i.e., before the young tender foliage appears. The most effective spray to control these diseases is Bordeaux mixture, 6 : 4 : 40.

Growers who have not yet collected suitable wood for grafting scions should do so as soon as possible. When collected the wood should be bundled, labelled, and heeled in moist soil in a cool, shady place. It is very important that such grafting scions should be quite dormant when the grafting operation is performed.

Septoria spotting of citrus trees has occurred in some groves, and as soon as the navel crop is harvested, these trees should be sprayed with

a 3 : 3 : 50 Bordeaux mixture. Valencia Late orange trees also may be sprayed with this mixture because weathering will largely remove the residue before this variety is harvested. As a supplementary measure of control of this disease, dead wood should be pruned out of the trees and burnt. If Septoria infection has occurred in the navel crop, it is advisable to harvest the complete crop as soon as possible, because this fungus will continue to cause spotting and wastage, as the fruit increases in maturity. Another problem which should not be lost sight of is that Septoria spotting can develop in the fruit after harvesting.

Fertilizer applications can be made to stone-fruit trees during this month. For mature peach trees, up to four pounds per tree of sulphate of ammonia, or its equivalent in some other form of nitrogen, will be necessary if vigorous growth and fruit production are to be maintained. The successful peach grower realizes the extreme importance of strong lateral growth on his trees; without it, he knows that both production and the quality of his fruit will deteriorate.

A new packing chart for the packing of mandarins in the long bushel case has been issued and is available free on application to the Director, Department of Agriculture, Treasury Gardens, Melbourne, C.2.

In the Garden

By A. W. JESSEP, M.Agr.Sc., B.Sc., Dip. Ed., Principal, School of Horticulture, Burnley

A COMMENCEMENT should now be made to prepare the ground for the sowing of such seedlings as antirrhinum, carnation, lupin, wallflower, scabious, verbena geum, stock, and aster. It is a busy time with the herbaceous plants, dividing them up and replanting such perennials as delphinium, canna, perennial aster, perennial phlox, helenium, rudbeckia, salvia, and lupin. Make an early planting of gladiolus to flower about Christmas time.

Top dress the lawn and carry out any re-seeding that may be required. If a new lawn is to be planted, the work should be carried out this month to give the plants a reasonable chance to become well established before the hot weather. One of the oldest and most popular flowering annuals is the stock. The flowers are sweetly scented and useful for both garden display and table decoration. With systematic planting, it is possible to have them in flower throughout the year.

It is important to secure good strains of stock, as they produce a proportion of singles, and the usual aim is to try and get a maximum number of double-flowering plants. The double-flowering plants do not produce seed and are completely sterile, producing neither stamens nor ovules. Therefore, the practice of some growers to leave some doubles with the single-flowering plants to obtain doubles producing seed from the singles has nothing to recommend it.

There are two types of singles, namely:—

The true single that produces only single flowers.

The heterozygous single which produces both double and single flowering plants. By carefully selecting from these heterozygous plants, strains are isolated which produce mostly doubles.

The proportion of doubles actually flowered may be increased by selecting the stronger seedlings, for it has been observed that the weaker ones are usually singles. Similarly, if seed is kept for two or three years, it does not germinate so well, but gives a larger proportion of doubles.

There are four different types of stocks, namely:—

Beauty of Nice is a quick grower and practically an all-the-year-round type. For winter blooms, sow the seed in January-February and transplant in March-April. It should then flower throughout the winter. Sow seed in March-April for spring and summer flowers. Good varieties include: Crimson King and Almond Blossom.

Ten-Week Varieties.—These flower in about ten weeks, but are not as prolific as the former. Good varieties include: Rose King, Scarlet King.

Intermediate flowers late in the summer and autumn. It is useful to follow the earlier ten-week type. Sow the seed in August-September, and it should flower from January onward.

Brompton is a biennial type and very beautiful, but takes about twelve months from the sowing of the seed until the flower is produced. Plant the seed in the spring and it should flower from the next spring until autumn. There are mixed colours. In each case, plant the seedlings about 12 inches to 18 inches apart. For winter flowers, select a well drained soil, well supplied with lime and in a good sunny position.

Vegetables.

The main work in the vegetable garden will consist in preparing the area for the spring planting. Keep the growing vegetables well hoed. If they do not appear to be growing well, and the soil is not too wet, give them an application of sulphate of ammonia, at the rate of about 1 oz. to the square yard, and lightly fork it in.

Make further sowings of lettuce, Greenfeast peas, carrot, parsnip, turnip, beet, and an early sowing of tomato under glass. It is necessary to commence tomato seeds under cover, and with a little heat, to have the plants hardened off and ready to plant out in early October. This will ensure tomatoes for Christmas.

Give the perennial plants attention this month, mulching the asparagus and such vegetables, pruning the small fruits, such as gooseberries and loganberries, and dividing and replanting culinary herbs as required.

Tomatoes are a very useful vegetable and produce a large amount of ripe fruit from the beginning of the year until March or April, so that a planting of seedlings in October and another in November are the only two plantings required, as the November plants will go on producing until the cold weather stops them.

Tomatoes, being frost tender, should not be planted until after all danger of frost has passed, but may be grown on in pots, so that they will be well developed before transplanting. In this case, knock them out of the pot, replant with as little disturbance to the roots as possible and give a thorough watering.

Some tomato plants respond to staking and pruning, such as Kondine Red, Recruit, Potentate, and Early Sunrise, while others will do very well without pruning or staking, such as Bendigo Large Red, Burwood Wonder, Orange Prolific, and South Australian Dwarf.

Probably the best sauce variety is San Marzano, but it is not of much value as a dessert variety.

The tomato takes about five months from seed sowing until ready for dessert purposes, and about 100 days or so from the time of planting well developed plants.

Place the young plants a little deeper in the soil than they were growing in the seedling stage, and about 18 inches to 24 inches apart, and about 3 to 5 feet between the rows, according to the variety and cultivation methods.

There are varieties to suit most districts, and further particulars on this matter, as well as information on all phases of tomato growing in this State may be obtained in the bulletin "Tomato Culture in Victoria," published by the Department of Agriculture. This bulletin may be had on application to the Director, Department of Agriculture, Melbourne, C.2, for the sum of 3d. (5d. posted).

Protection of Large Wounds in Fruit Trees

Large wounds on fruit trees whether caused by removing a large limb during pruning, by an accidental knock from cultivating implements or by any other cause, *if neglected*, often cause serious losses in an orchard through infection with the *Polystictis* fungus or other fungi gaining entrance through the wound.

The wound should be covered as soon as possible by some air-excluding, weather-resisting material such as grafting wax or ordinary white lead paint.

A stiff paste of Bordeaux mixture applied to a wound is helpful in stopping fungi from gaining entrance, but this needs to be covered by some sort of binding or else renewed now and again. Wounds, if treated as advised, will heal over much more quickly.

On saw cuts, the ragged edges should be cut off before applying the dressing. In the case of old wounds, all dead wood should be removed down to the live wood before applying the dressing, and in the case of very old wounds, where the wood has rotted away, leaving a deep cavity, this should be filled in with cement.

Remember, a wound, if neglected, can cause the death of the tree, and in the case of apples and pears, can be a hiding place for over-wintering larvae of the codling moth.

Nutrition of the Tobacco Plant

Relation to Soil Conditions

By F. PENMAN., M.Sc., Assistant Research Chemist

THE objects of this phase of the investigation, the first part of which was reported in this *Journal* for May, 1941, were to gain preliminary information on the nutrition of the tobacco plant on the main soil types defined by the soil survey, and to examine any indication that experimental work might be desirable along particular lines concerned with plant nutrition. Both the major nutrients and the "minor elements" were considered in this work.

Available Nitrogen in Soils and Nitrogen Contents of the Crops.

Tobacco lands usually are worked up for planting by means of intensive cultivation during a relatively short period. On this particular area, preparation of the land was begun early in October, 1939, and planting began early in November. Among other factors, the recent cropping history of the land and the methods used to prepare it for tobacco may be expected to influence the amounts of available nitrogen in the soils at planting time. Most of the area had grown tobacco in the 1938-39 season, and therefore carried tobacco stalks with miscellaneous weeds, including some trefoil, when preparation began. That portion of the area which had not grown tobacco last season, mainly on the less attractive soil type designated Type 3, was carrying a thick growth of trefoil along with other weeds at the beginning of October. By the time the soils were examined in early November, Types 1 and 2 were in excellent tilth, following disc ploughing, harrowing, rolling, &c., while the southern part of Type 3, which had not been worked to similar extent, had in some places set down fairly hard following rain.

The results of examination for available nitrogen of the surface 10 inches of soil from each of the three main types, early in November, 1939, are given in Table 9, together with figures for the moisture contents of the soils at the time of sampling.

TABLE 9.—MOISTURE AND AVAILABLE NITROGEN IN MYRTLEFORD SOILS AT PLANTING TIME.

Soil.	Depth (Inch).	Moisture as Percentage of Dry Soil.	Nitrogen, parts per Million of Dry Soil, in the Form of—			
			Ammonia.	Nitrate.	Nitrite.	Sum of Three Forms.
Type 1	0–5	13·3	3·0	6·1	0·0	9·1
	5–10	17·4	1·6	3·8	0·0	5·4
Type 2	0–5	18·1	4·7	12·4	0·2	17·3
	5–10	18·1	4·2	7·0	0·1	11·3
Type 3	0·5	22·6	7·1	15·5	0·1	22·7
	5–10	24·5	3·5	5·7	0·1	9·3

In view of recent rainfall before sampling, the moisture contents of the soils are of interest in that they give some indication of the field moisture-holding capacity, which varies in a manner consistent with the differences in the textures of the three soil types. It is evident that these soils will hold a great deal more water than the average light American soils mentioned formerly.

As is usual in cultivated soils, nitrate is the most important among the forms of nitrogen determined. "Available" nitrogen is least in Type 1, the lightest soil, with the least content of total nitrogen, and with a record of heavy cropping. Type 3 shows the highest content of available nitrogen, attributable to the absence of a sown crop in the previous season and to the growth of trefoil. In all types, all forms of available nitrogen in the surface soils exceed those in the sub-surface zones. Such a distribution is favourable, indicating that leaching has been relatively restricted.

Whether the amounts of available nitrogen found in these soils at planting time are sufficient to indicate that there will be no deficiency of nitrogen supply for tobacco is an interesting problem. It has been pointed out that "it is not known just what the level of soluble nitrogen should be in soil to make sure that nitrogen is not deficient for growth of tobacco" (Karraker and Bortner, 1934). From the work of these authors, however, it appears that the

level of nitrate nitrogen should be maintained at more than 25 lb. per acre in the plough-layer. In Kentucky, 100 lb. of nitrate nitrogen per acre can be expected in the summer in soil prepared in a month or so for tobacco (Karraker and Bortner, 1937). In the surface 10 inches of these Myrtleford soils there are present about 15, 30, and 32 lb. per acre of nitrate nitrogen in Types 1, 2, and 3, respectively, at planting time. It would appear then that, particularly in Type 1, the content of nitrate in the soil is somewhat deficient.

Experience in connexion with nitrate accumulation in Victorian soils indicates that considerable amounts of nitrate probably would become available in these soils during the summer. Assuming that all three forms of nitrogen given in Table 9 are completely available, the total amounts per acre are greater for Types 2 and 3 and considerably less for Type 1 than the amounts of total nitrogen, calculated to an acre basis, found in the better-developed tobacco plants harvested from these soils in February, 1940. This comparison is made in Table 10, indicating, in the case of Soil Type 1, that considerable quantities of nitrogen may become available during the season, no nitrogenous fertilizer having been used on the crop.

Table 10.—Available Nitrogen in Soils at Planting Time, and Nitrogen in Leaves and Stems of Tobacco Crops at Harvest Time (lb. per acre).

Soil Type.	1.	2.	3.
Total "available" nitrogen in the soil at planting time ..	22	43	48
Nitrate nitrogen in the soil at planting time	15	30	32
Total nitrogen in the crop at harvest	38	34	31

Table 10 indicates further that the amounts of available nitrogen in the soils at planting time do not provide reliable estimates of the relative amounts of nitrogen which may be expected in the crop at harvest. The nitrogen content of the crop on Type 1 is greater than that for Type 2, although the latter had a much greater content of available nitrogen in the soil at planting time. It seems, therefore, that soil conditions subsequent to planting are dominant in determining the course of nitrogen nutrition of the tobacco plant in this area, and that nitrogen becomes available in sufficient quantity during the season, even from the soil type with the lowest inherent capacity in this respect, to ensure that no deficiency exists in nitrogen supply for the tobacco plant. The latter deduction is made from the considerable total amount of nitrogen per acre present in fully developed plants (Table 10), and from the substantial nitrogen content in the dried leaves (Table 12). If conditions similar to these exist in the average season, it would appear that, if nitrogenous fertilizer is needed at all, a relatively small application at planting time usually should suffice to ensure adequate nitrogen supply for early growth, the soil being capable of meeting later requirements. At planting time, the soil contains either a sufficient amount, or a considerable proportion of that amount, of available nitrogen to supply the nitrogen needs of a big tobacco crop, and it appears that further nitrogen becomes available from the soil during the season at a satisfactory rate.

Composition of Tobacco Plants.

Early in February, 1940, tobacco plants representative of the better-developed portions of the crop were selected from areas of the variety Hickory Pryor on the three main soil types. The plants all had about eleven weeks' growth since transplanting, were standing about 28 to 30 inches high, and showing the flower bud. Superphosphate at the rate of 5 cwt. per acre had been used with the crop, but no other fertilizer on these particular areas. The season had been dry. Single typical plants were removed as samples, including the upper parts of the root systems. In addition to these samples, four plants affected by the condition known as "yellow dwarf" were taken. These plants averaged only 11 inches in height, although of similar age to the other plants. In Table 11 are given the oven-dry weights per plant for leaves, stems, and root crowns of tobacco plants, taken at the stage described, just prior to the first clearing pick of leaf.

Table 11.—Dry Weights of Hickory Pryor Tobacco.

(Grammes per Plant.)

—	Leaves.	Stems.	Root Crowns.
Type 1. Normal plants ..	60·2	33·2	15·6
„ "Yellow dwarf" plants ..	11·1	3·8	2·3
Type 2. Normal plants ..	65·2	30·8	14·7
Type 3. Normal plants ..	52·6	18·9	11·1

A young crop of tobacco on river flat land, Ovens River Valley.

The drastic effect of "yellow dwarf" or "stunt", which has been identified as a virus disease (C.S.I.R., 1939), on development of the tobacco plant is evident from the figures given for height and weight of plants. The data for leaves and stems are fairly similar for normal plants on each of the three main soil types, except that the ratio of stem to leaf is much the lowest on the heaviest soil, Type 3.

Results of analysis of leaves and stems are given in Table 12, the samples being those described in connexion with Table 11.

Considering the normal plants on different soil types, the contents of total nitrogen and of total ash in the leaves are higher than average results recorded for the American flue-cured type of leaf. The ash content of the stems is markedly lower than that of the leaves and the nitrogen content is definitely lower. The nitrogen contents of the leaves from the different types of soil are not related to the amounts of available nitrogen in the soils at planting time. Silica-free ash content is high throughout, as is also the content of magnesia

TABLE 12.—COMPOSITION OF HICKORY PRYOR TOBACCO FROM DIFFERENT SOIL TYPES.
(As Percentages on Dry Basis.)

—	Nitrogen.	Total Ash.	Silica.	Silica-free Ash.	P_2O_5.	K_2O.	CaO.	MgO.
Type 1. Normal plants—								
Leaves	2·87	20·35	3·51	16·84	0·64	3·68	4·17	1·74
Stems	2·09	8·30	0·35	7·95	0·54	3·16	0·93	0·47
Type 1. "Yellow-dwarf" plants—								
Leaves	2·12	21·50	9·06	12·44	0·34	1·63	3·44	0·92
Stems	2·33	9·97	2·25	7·72	0·40	2·45	1·17	0·55
Type 2. Normal plants—								
Leaves	2·49	18·10	2·93	15·17	0·47	2·13	4·35	1·74
Stems	1·98	7·39	0·38	7·01	0·43	2·24	0·95	0·54
Type 3. Normal plants—								
Leaves	3·13	19·97	4·29	15·68	0·58	3·55	3·18	1·14
Stems	1·97	10·42	0·52	9·90	0·53	3·99	1·01	0·65

(MgO); the proportions of phosphoric acid (P_2O_5) and of lime (CaO) are normal, except for the low lime value for leaf grown on Type 3 soil. The potash (K_2O) content is normal, except for a low result for leaf from Type 2 soil. The analyses of the stems are comparable with those of the leaves in potash and phosphoric acid, but are markedly lower in silica-free ash, lime and magnesia.

On the assumption that the plants concerned in Tables 11 and 12 are representative of the entire crop (actually the plants selected were better than average), the amounts of nutrient materials may be calculated for an acre of crop on each soil type. These amounts are given in Table 13.

TABLE 13.—AMOUNTS OF NUTRIENTS (POUNDS) PER ACRE OF TOBACCO CROP ON DIFFERENT SOIL TYPES.

—	Dry weight of crop.	N.	P_2O_5.	K_2O.	CaO.	MgO.
Type 1—						
Leaves	928	27	6	34	39	16
Stems	512	11	3	16	5	2
Total	1,440	38	9	50	44	18
Type 2—						
Leaves	1,006	25	5	21	44	17
Stems	476	9	2	11	5	3
Total	1,482	34	7	32	49	20
Type 3—						
Leaves	812	25	5	29	26	9
Stems	292	6	2	12	3	2
Total	1,104	31	7	41	29	11

Apart from the low potash content of the crop from Type 2 and the low lime and nitrogen content from Type 3, the figures show some approach to uniformity. It appears that a crop approaching maturity under these conditions contains in its leaves and stems nitrogen equivalent to about 140 pounds per acre of sulphate of ammonia, phosphoric acid equivalent to about 40 pounds of superphosphate and potash equivalent to about 100 pounds of sulphate of potash. Probably these figures by themselves give no particular indication of the needs of these soils for fertilizer applications, as it appears that the important point is the amounts of fertilizer which will produce the optimum rate of growth. The figures are of some value, however, as adjuncts to the data obtained from the soil investigations. It is of interest to note that superphosphate was the only fertilizer used with these particular crops and that the amounts of phosphate actually present in the crop are only small proportions of that applied, about 7 per cent, as a maximum. In addition to phosphatic fertilizer applied, the soil itself contains a considerable amount of available phosphate. With regard to potash, the crop on Type 2 soil, which has the lowest content of potash according to Tables 12 and 13, was observed by Tobacco Officers to show certain symptoms which were regarded as indicative of potash deficiency. The ratio of lime to potash is abnormally high in the leaves of this crop.

It was remarked previously that silica-free ash is comparatively high in these Myrtleford tobacco leaves. In all the leaf analyses given in Table 12, there is a fairly constant difference, amounting to about 6 per cent. of the dry weight of the leaf, between silica-free ash and the sum of P_2O_5, K_2O, CaO and MgO. This difference is large, and although part of it can be expected to consist of such undetermined constituents as sulphate, chloride, iron and aluminium oxides, &c., it appears that further investigation of this phase is desirable. The mineral composition of "yellow dwarf" plants will be discussed later.

"Minor Elements."

On certain of the leaf samples, analyses were made to determine the amounts of boron, zinc, copper or manganese present. The results are given in Table 14.

TABLE 14.—"MINOR ELEMENTS" IN TOBACCO LEAVES.

(Parts per Million of Dry Leaf.)

—	Boron.	Zinc.	Copper.	Manganese.
Type 1. Normal plants	8	67	..	..
" "Yellow dwarf" plants ..	24	..	..	..
Type 2. Normal plants	..	55	13	57

In consideration of the so-called "minor elements," it is necessary to decide whether the elements are present in sufficient quantity to allow normal plant growth and yet not in sufficient amounts to cause any harmful effect. It is known, for example, that certain concentrations of manganese compounds in tobacco cause toxic effects (Bortner, 1935; Jacobson and Swanback, 1932). The analysis for manganese content given in Table 14 indicates that the supply of manganese from Type 2 soil is at a satisfactory, although rather high, level. As soil reaction partly determines the question of manganese availability, it is probable that conditions in Types 1 and 3 are also satisfactory from this aspect. No published information on the contents of zinc and copper in tobacco leaves is available for comparison with the figures given in Table 14. Judged by the contents of the metals usually present in other plants, however, it would appear that they are present in these leaves in sufficient quantity and not to an extent likely to cause any deleterious action.

In the case of boron, Type 1 is the soil most likely to be deficient, and the analysis for leaves of normal plants grown on this type suggests that there may be, in fact, a deficiency in supply of boron compounds in this area. Plants affected with "yellow dwarf" on the same soil show a remarkable concentration of boron as compared with the normal plants, but it appears likely that this is a result of their diseased condition rather than a partial cause of their symptoms. A more complete discussion of the mineral composition of these diseased plants is given below.

It appears rather likely that in these Myrtleford soils, particularly the lighter ones, there is a deficiency of boron below the optimum amount and that this condition, together with a similar state as regards available potash, may account partly for certain abnormalities in the mineral composition of plants grown in this area. Experiments using borax applications up to, say, 10 lb. per acre appear desirable.

"Yellow Dwarf" Tobacco Plants.

Apart from its obvious effects on plant development, as illustrated by the figures given in Table 11 and the accompanying discussion, the diseased condition known as "stunt" or "yellow dwarf" has a profound effect on the mineral nutrition of the tobaco plant. Table 12 shows that leaves from these plants are markedly lower in contents of nitrogen and of silica-free ash, and of all ash constituents determined, than are the leaves from healthy plants grown nearby on the same soil type. Silica is much higher in the diseased plants, but this is probably due mainly to a greater relative amount of sand mechanically held on

Irrigating tobacco experiment areas.

the stunted plants. In the stems, differences in composition between the normal and diseased plants are not as great; the contents of nitrogen, lime and magnesia are greater in the diseased than in the normal plants, while potash and phosphoric acid are definitely lower.

The reduction of ash constituents in the leaves of the diseased plants falls most heavily on potash, phosphate and magnesia, but less so on lime. This results in an abnormal ratio of lime to potash. It seems that the mineral metabolism is deranged as a result of the virus disease and that this is reflected chiefly in changes in the composition of the leaves, an increase in boron content being associated with marked decreases in constituents such as potash and magnesia.

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MEAT EXPORT TRADE—*(continued from page 371).*

contract year. But the Commonwealth Government will purchase canned pork sausages, canned shoulder and middle rashers, and canned ham rashers up to the equivalent of 24,000 tons of fresh or frozen pork. By far the largest of these classes will be canned sausages, for which very large orders have been received from the Army authorities. The price to be paid by the Government will be such as to enable the canners to give a reasonable price to the pig producer. The pig required by the canners for sausages will be a heavier one than that required for bacon. Producers will have to alter their methods to produce this heavier pig—the main thing for them to bear in mind is that under no circumstances is an over-fat or rough chopper pig desirable.

Beef.

The outlook for beef is somewhat better than that for other sections of the trade. It is not considered likely that it will be necessary to make any drastic alterations in conditions before the end of the current contract year. But beef producers have already had their trade in frozen beef reduced to only 1st and 2nd quality ox and heifer quarter beef. All other classes must be disposed of in other ways—mostly to the canning operators—at prices much below the United Kingdom contract price. In the third year of the war it is anticipated that returns for even quarter beef will be somewhat lower, if, as is expected, further quantities have to be prohibited export in the frozen form. In this event both 1st and 2nd quality crops will be bought by the Commonwealth Government at a price below the United Kingdom contract price. Such of these as can be shipped will be sold to the United Kingdom Government at contract prices and the remainder sold to canning operators at the canning price. In this manner the burden of reduced exports will be borne equally by all producers of export quality cattle.

Summing up, it may be said that producers can now face the coming year with a sense of greater security. They must realize, however, that the shipping position will be very serious and the Government has made it very clear that, in the case of lamb, it is most unlikely that they will purchase the whole output. It would be disastrous to mortgage the future by filling cold stores during the third contract year and thus jeopardize the storage position for the fourth year. Therefore, it may be assumed that only certain grades and weight ranges will be purchased under the scheme, and the remainder of the output will have to be consumed locally. Production in the future must be reduced, otherwise it will bring disaster of a kind that even the Government could not meet.

In the case of pigs it does not appear desirable to encourage any increase in production. As regards beef it is hoped that the industry can be maintained in a position to take its rightful place in the markets of the world at the end of the war.

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Issued by direction of the Hon. E. J. Hogan, M.L.A., Minister of Agriculture.

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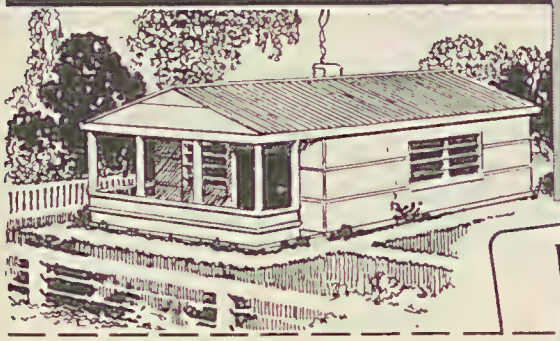

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The Journal of the DEPARTMENT of AGRICULTURE of VICTORIA

Journal of Agriculture, Victoria—September, 1941.

Standard Herd Test

Report for the Year 1940-41

By W. J. YUILL, Supervisor of Herd Testing

TO some extent, the past season was much like that of 1939. In both years, a very dry winter was followed by lean spring pastures, and there was every indication of a State-wide drought. Late spring and early summer rains, however, provided abundant growth throughout most of the eastern half of the State. In some areas of the North-east, and in Eastern Gippsland, the herds during January and February actually improved on their spring time flush of milk. Drought conditions, however, were more or less general throughout much of the Western and North-western areas.

"Road's End Sandra," this year's champion herd test cow with a yield of 811 lb. butterfat. She is owned Mr. R. W. Smith, Swan Hill.

In such circumstances, the average yield of 345 lb. butter-fat from 2,078 cows must be considered very satisfactory.

In last year's report, reference was made to the difficulty being experienced by the District Herd Testing Associations in obtaining suitable herd-testers. Owing to the continued loss of testers to the various military camps and fighting forces, many of these bodies have been forced to close down, possibly for the duration of the war. Because of this loss of herd-testing service to the District Herd Testing Associations, more than 60 herds have entered or re-entered the Standard Herd Test during the period referred to, while fresh inquiries are being received each week. As a consequence 26 per cent. more cows appear in this year's report than was the case last year.

In some instances, herds are being re-tested so that information may be available for prospective buyers when the second portion of the Cattle Breeding Act comes into operation in 1945. In this connexion it is interesting to note the proposed action of the Central Council of Jersey breeders in New Zealand to deny the transfer of registered bulls as pedigreed animals, unless the dam under test has reached prescribed minimum yields, either in the Government or special Group Herd Test. A further proposal is to introduce an

Four leading members of Mr. R. M. Chirnside's Mornmoot Jersey stud, the champion herd for the seventh successive year. 1. "Mornmoot Fancy Starbright," mature (677 lb. butterfat); 2. "Mornmoot Madeira 9th," Junior 4 (661 lb. butterfat); 3. "Mornmoot Satisfaction 2nd," mature (630 lb. butterfat); 4. "Mornmoot Mimi," senior 3 (610 lb. butterfat).

Elite Bull Scheme. Any bull placed on the New Zealand Dairy Board's "Official Sire Survey" scheme, will be accepted as an "Elite" sire, subject to certain qualifications regarding minimum yields, and numbers of daughters in the index. At least 60 per cent. of the daughters must also obtain a classification rating.

The Champion Herd.

During the 29 years that the Standard Herd Test has been functioning, there have been herds which temporarily occupied a prominent position; while others have maintained their superiority over many years. Never, however, in that period has there been such outstanding superiority as that shown by the Mornmoot Jerseys.

A careful search has failed to reveal information of any herd anywhere holding a herd-test championship for seven consecutive years as is the case with Mr. R. M. Chirnside's herd. This feat might therefore well constitute a world record. There is little more to add to what has been written in previous reports concerning the excellence of the cattle in the herd and of its management, but it might be stated that during the past seven years the herd has produced two State champions, each of which has exceeded the 700-lb. butterfat level on three occasions.

During the period of continued championship form, nearly 100 individual records of more than 500-lb. butterfat have been made. Of this number, over 30 have exceeded the 600 lb. mark—ten of them being above the 700-lb. level.

A further testimony to the herd's efficiency is seen in the number of Mornmoot cows to qualify for the Standard Herd Test Advanced Register. The two leading positions over all breeds are held by "Mornmoot Princess

Madeira" and her daughter "Mornmoot Princess Madeira 3rd." Not only have these two cows the highest qualifying yields in the register, but they have also remarkable yields over a long period. These are referred to in this year's report of the Register, elsewhere in this issue.

On several occasions Mornmoot first calvers have produced over 500 lb. butterfat, while yields of 400-lb. at this age are quite common. The Mornmoot "Madeiras" and "Starbrights" are known far and wide throughout herd-testing areas, for sires from these great families are to be found in many herds throughout Victoria.

Captain A. E. T. Payne's "Yarraview Le Mode," the leading junior four-year-old, 738 lb. butterfat.

The Reserve Champion Herd, owned by Messrs. F. A. and L. Williams, has been built up largely from the progeny of two great dairy Jerseys, namely, "Wompini Rose Marie"—a 662-lb. butterfat cow—and "Ballara Bonnie"—one of the truly great Jerseys of this State. No greater justification for this description is needed, than that during her nine strenuous lactations she has produced over 36 tons of milk and nearly 2½ tons of butterfat.

When "Bamawm Leon"—a son of "Wompini Rose Marie"—was mated with "Ballara Bonnie," they left two great daughters. One

Some members of Messrs. F. A. and L. Williams' reserve champion herd. The fifteen cows in this herd averaged 505 lb. butterfat.

This mature Friesian cow "Glenloth View De Kol" (Salesian College) produced 664 lb. butterfat.

of these—"Bamawm Bonnie Lass 2nd."—leads the herd yields with the fine performance of 750 lb. butterfat. Two other daughters of "Bamawm Leon" are among the nine mature cows that averaged 574 lb.

It is through "Ballara Bonnie," however, that the stud has been so greatly improved, for it is largely composed of her descendants, through two daughters, and her sons "Bamawm Bugler" (by "Bamawm Leon"), and "Bamawm Bonnie Boy." Several of the outstanding members of the herd are by the last-named bull, whose breeding suggested that he would be a real herd-builder. His sire "Belgonia Blossom 2nd's Twylish," was by a son of "Bright Twylish of Belgonia" and "Wattle of Springhurst"—a noted producer of other years (four of her records being over 500 lb. butterfat).

An interesting feature about "Bright Twylish of Belgonia" is his very high Equal Parent Index. An early survey showed that he possessed the inheritance to raise the milk yield and the butterfat percentage—even when mated with cows of unusual producing capacity.

The future of the Bamawm herd appears secure, for a high proportion of the Junior cows are yielding around the 400-lb. butterfat level; while the splendid average of 505 lb. butterfat (without allowances) for fifteen head, tells its own story of the unusual dairy ability of the herd, and of Mr. L. Williams's special knowledge of handling a team of test cows.

In third place is Captain A. E. T. Payne's herd of 27 "Yarraview" Guernseys, with an average yield of 462 lb. butterfat, a figure that is increased to 525 lb. when all allowances are considered.

The Belgonia stud occupies the next position with 425 lb. butterfat for 25 head. The excellent yield of thirteen Junior two-year-olds by "Aim High Imp." materially assisted in raising the herd average to 512 lb. Among the fine mature cows that averaged 510 lb. butterfat are "Belgonia Junette 3rd" and "Junette 5," two of this year's "over 600 lb." group.

The "Finchley" stud of Messrs. T. M. Noble and Sons moves up into fifth place, largely because of the excellent performance of Twenty Junior cows including "Finchley Bluebell's Duchess," this year's leading Junior two-year-old (a twin) with 535 lb. butterfat. The herd of 31 had the splendid average of 510 lb. when Junior cow and herd-size allowances were added.

Mr. N. H. Enders' stud, "The Wattles," has, for some time past, been one of the leading herds in the under fifteen cow section. On this occasion, his fifteen cows averaged 506 lb., including "The Wattles Petal," one of the "over 600 pounders" of the year.

Among the sub-herds of less than fifteen cows, the Ayrshire stud of Mr. J. H. Goddard stands out prominently. His ten cows averaged within a half pound of 500 lb. actual butterfat. "Inverurie Blue Belle," the reserve champion cow, "Inverurie Maggie," 672 lb., and "Inverurie Belle"—third in the Junior—two class, are members of this very select herd.

Other herds in this section to do well are owned by S. H. Masters and Son's, R. H. Mitchell, Nancarrow Bros., and T. S. Powell.

There were also some meritorious performances among the herds which exceeded the 400-lb. butterfat level. They included 37 cows of the Ballarat Orphanage with 417 lb. butterfat, "Orphanage Mirthmaker 9th" being one of the "over 600 lb." group of the year.

The 391-lb. average of fourteen Junior two-year-olds of J. W. Bennett was a special feature of the herd's 414 lb. butterfat average. Messrs. H. W. Waterhouse and Son—newcomers from association ranks—are well to the fore with 27 cows and 407 lb. butterfat; while the "even" 400 lb. average of 30 cows at Devon Park stud is a splendid effort.

"Belgonia Eileen 2nd," mature, Devon Park stud, Lilydale, 660 lb. butterfat.

The Jerseys of J. E. Handbury and Son and the Friesians of R. W. Smith have similar herd-size and butterfat yields. The latter herd has recently transferred from association ranks. A feature of this herd's performance is the 524 lb. butterfat average of seven mature cows—one of them being "Road's End Sandra," this year's Champion Standard Test Cow.

Messrs. Vaughan Bros. "Lynroy" stud, Mr. F. Austin's "Avalon" Jerseys, and Dr. A. R. Haywood's "Windrest" herd all have similar butterfat yields. However, owing to the better heifer yields of the latter herd, it gains a short lead when all allowances are considered.

Mr. F. W. Clarke's nineteen Jerseys are also close to the 400-lb. butterfat mark. A feature of this herd is its high average test.

Among the outstanding performances of the year are those of the 401-lb. butterfat average of 25 mature cows in the "Maxon" herd of 61 animals, and the 30 mature "Willow Park" Shorthorns in a herd of 64 cows.

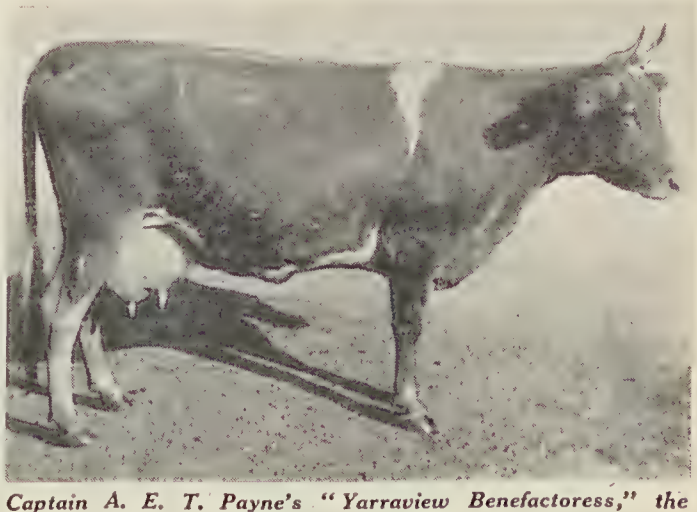
The 390-lb. average of fifteen Research Farm Red Polls in a herd of 53, are also figures that contain much merit; for it must be remembered that high records are more difficult to obtain when the herd is large.

Actually there are nearly as many cows in these three herds as in all the herds listed in the "under 15 cow" section of the herd averages. The full significance of the yields made by all herds tabled can be truly appreciated only in the light of the environment and herd size; and also the feeding and management cost, for some breeders make no secret of their lack of interest in economic yields, while others, who obtain their livelihood mainly from butterfat returns, must make profitable yields their first consideration.

Champion Cow.

Not since 1933 has the champion cow of the year been a Friesian. The splendid performance of 811 lb. butterfat by "Road's End Sandra" is all the more noteworthy, since it was made on twice-a-day milking. The new champion has a mind of her own, and it is probably due to this fact that she owes her championship. She very definitely objects to machine milking, so she became the house cow at the homestead—while all the rest of herd were machine milked at the dairy farm, which is controlled by Mr. Smith, jun.

"Road's End Sandra" was milked by Mr. R. W. Smith (now in his 74th year). Mr. Smith is very proud of the achievement, and not a little proud of the fact that Sandra has a pronounced and special regard for his milking and attention. If she had any special advantage, it lay in the fact that she had the pre-grazing of a number of small lucerne paddocks, the heifers and calves being used as followers. She received a concentrate ration at the bail, consisting mainly of wheat, bran, and linseed meal. Her average butterfat percentage is over 4 per cent., at least ½ per cent. higher than the breed average. This difference, although small, amounts to



Captain A. E. T. Payne's "Yarraview Benefactoress," the leading senior two-year-old, 632 lb. butterfat.

Mr. J. H. Goddard's reserve champion cow "Inverurie Blue Belle," the leading senior three-year-old. She produced 770 lb. butterfat.

a considerable amount of butterfat when a large milk weight is being considered. In the Swan Hill District Test this cow finished twice in one year—both yields being well over 600 lb. butterfat. Her average test of more than 4 per cent. is again shown in the last two years of the Government Standard Test, when she produced, as under:—

Year.	lb. Milk.	Test.	lb. Butterfat.	Last Day Milk.
1939-40 ..	16,280	4.07	662	50 lb.
1940-41 ..	19,397	4.18	811	55 lb.

The Reserve Champion Cow, "Inverurie Blue Belle," combines the breeding of two great all-round Ayrshire cows. Her dam, "Donside Thistledown 2nd," and her sire's dam "Donside Lydo Lady," occupy first and second places in the Ayrshire section of the Advanced Register with qualifying yields of 515 lb. and 623 lb. respectively. Both cows are daughters of "Olivedale Chum," and each is a great show cow in addition to being an outstanding producer.

"Inverurie Blue Belle" has inherited high yielding ability from both parents, and what is of greater importance is passing it on, for her daughter is third among 516 Junior two-year-olds of all breeds, with a 484-lb. yield. She holds the Junior two- and Senior two-year-old records of the breed in Victoria; and although still a Senior three-year-old, has produced 770 lb. butterfat—only a few pounds behind the State breed record for any age. This cow was milked thrice a day for four months in the spring, when her highest daily official milk weight was 81½ lb. Just how remarkable a cow she is, is perhaps best seen by her 1,887 lb. butterfat to date. In normal circumstances she should be capable of breaking other herd records, for her owner, Mr. J. H. Goddard, has little to learn in handling such cows.

"Inverurie Maggie's" record of 670 lb. butterfat, and "Inverurie Hester's" 592-lb. yield would be unusual if "Blue Belle's" effort were not known.

Two of the highest-producing cows of the year come from the Reserve Champion herd, for "Bamawm Bonnie Lass 2nd" (750 lb. butterfat), and "Bamawm Primrose" (672 lb. butterfat) are second and fourth among the leading mature cows. They are daughter and granddaughter of "Ballara Bonnie," whose great work is referred to elsewhere in this report.

No fewer than five of the individuals on the Junior cow lists come from the "Yarraview" Guernsey stud. "Yarraview Le Mode," who broke the Junior-two record in 1939 with 563 lb. butterfat, is now the leading Junior

"Karrara Fancy Madeira" (Devon Park stud) was the leading junior three-year-old with 652 lb. butterfat.

[Continued on page 452

Stabilization of Price of Potatoes

Enthusiastic Growers' Meeting at Wallace

ALMOST every Victorian potato-growing district was represented at a crowded meeting held at Wallace on Monday night, 28th July, 1941, when the Minister of Agriculture (Mr. E. J. Hogan) and the Federal Prices Commissioner (Professor Copland) explained the price-fixing plans for potatoes. Hundreds of growers could not enter the hall.

Mr. Ellwood, President of the Wallace Branch of the Victorian Potato Growers' Association was in the chair, and Mr. J. M. Ward, Superintendent of Horticulture and Chairman of the Victorian Potato Committee, and Messrs. A. Boustead and W. Chapman, growers' representatives on the Committee, and Messrs. Noonan and Tinney, merchants' representatives on the Committee were also present.

The Minister of Agriculture (Mr. Hogan) said that the problem of stabilizing the price of potatoes for the balance of the year was a very difficult one and necessitated Government assistance. When it became known that there would be a big surplus of potatoes, the Executive of the Potato Growers' Association on 21st February, 1941, carried a resolution approving the fixing of the price for this year, and that was re-affirmed at meetings of growers at Wallace, Bungaree, Dunnstown, Newlyn, Daylesford and Trentham. Credit was due to Messrs. Chapman and Boustead for the work they had done for the growers during this emergency and during the last six years.

After the rain in January, it became evident that the open market would be glutted and the price would be unprofitable this season. First-grade potatoes actually fell to 35s. per ton. The cost of digging was 15s. per ton, while second-hand bags cost 10s. per ton, and freight to Melbourne and unloading 10s. Commission and other charges brought the total cost of digging and selling and freight to £1 19s. 9d. a ton, leaving only 3d. per ton to the grower if he sold potatoes for £2 per ton.

In 1938, Mr. Hogan continued, the Commonwealth and State Governments provided a home consumption price for wheat, and it was fair that there should be a home consumption price for potatoes. Consequently, he made strong representations to the State and Federal Governments to fix the price for table potatoes. The Victorian Government and the Federal Government agreed to a Plan for Victoria, New South Wales, and Tasmania, but the Tasmanian Labour Government would not agree to the Plan and the benefits of stabilization had been delayed for two months because of that refusal by the Tasmanian Labour Government to co-operate with the Victorian and New South Wales Governments. At Mr. Hogan's request, a second plan was then evolved by Professor Copland to stabilize the price of potatoes in Victoria only. The Prices Commissioner had power to fix maximum prices only and he had fixed £6 per ton to growers for first-grade potatoes on rail at Spencer-street. A Committee had been appointed to regulate the supply of first-grade potatoes to the Victorian market. The surplus of first-grade potatoes could be exported by growers or merchants to Sydney and Brisbane as in the past according to the law of supply and demand.

The Plan would come into operation on the 2nd August, Mr. Hogan went on, and the full co-operation of the growers was required to make the Plan succeed. It was far better for potato growers to get £6 per ton for half their first-grade potatoes than to get £2 or 30s. a ton for half of them. About 50,000 tons would be used for human consumption in Victoria during the balance of the year. No more could be sold in Victoria for human consumption no matter how cheap they were, so the Plan would benefit the Victorian growers by about £200,000 this year if it were loyally accepted and supported by the growers.

Mr. Hogan thanked the Minister for Customs (Mr. Harrison) and Professor Copland for approving the Plan to stabilize the price of potatoes.

Professor Copland said he regretted that the Plan was not in operation for the whole of Australia, but the fault was neither Mr. Hogan's nor his. The Plan that could have acted for the

whole of Australia was turned down by Tasmania, but Mr. Hogan had persevered and a Plan for Victoria alone was produced. It was the first time in the history of potato growing in Australia that such a Plan had been attempted. There would be difficulties, but a 75 per cent. success this year would be a fine achievement and would enable them to do better next year. It might be asked why not fix a minimum price and be done with it. What was the use of fixing a theoretical price when they had a market glutted with potatoes? The way to get a minimum price was to control deliveries to the market and so arrange it that each would get the same relative benefit from the Plan. It was very necessary that there should be co-operation of the growers.

Such powers would be taken that it would not be worth while retailing potatoes which did not bear the seal of the Department of Agriculture.

A 5 per cent. margin of 5s. per ton had been fixed for the merchant and a margin had been fixed for the retailer also.

It might be asked how could they stop potatoes coming into the State and spoiling the Plan. It could be done on the basis of price discrimination. If potatoes came in from another State, they would not have the seal of the Department of Agriculture on them, and it would not pay anybody to handle them. Merchants would not be allowed to handle such potatoes unless they were sold at not more than 10s. per ton.

It had been agreed that potatoes from Victoria should not be dumped into New South Wales. A fair quota would be exported there but not more than that. It would not pay the Victorian grower to dump potatoes in New South Wales because it would reduce the export price.

He had published an order to show the maximum price the retailer must charge for potatoes which came into his store. At a price of about £6 per ton at Spencer-street, the retail price in Melbourne would be between 12 and 14 lb. for 1s. 14 lb. for 1s. was about £8 per ton, and the retailer had to meet the price of transport from Spencer-street.

The work could not be done unless the deliveries were controlled and the producers were prepared to let the experiment go on for a while and put up with some inconvenience.

Mr. B. Clark, Secretary of the Wallace Branch of the Victorian Potato Growers' Association, moved that:—

> This meeting of potato growers of Victoria expresses unanimous approval of the stabilization plan as adopted by the Federal and State Governments and expresses wholehearted appreciation of the Minister of Agriculture (Mr. Hogan), the Prices Commissioner (Professor Copland), and his Deputy (Mr. Bishop) for their efforts on behalf of the potato growers.

The motion was seconded by Mr. Quine, President of the Daylesford Branch and carried with acclamation.

Prosecutions Under the Sheep Dipping Act

On 24th July, at Bairnsdale Court of Petty Sessions, J. P. Treasure, of Maffra, was convicted and fined £3 with £1 18s. 3d. costs for an offence under section 10 of the Sheep Dipping Act.

On 5th August, W. F. O'Shannesy, of Yarragon, was fined £3 at the Flemington Court for a similar offence.

In both cases, evidence was given by the local inspector of stock that sheep infected with lice were found in a sale yard. In convicting, the Bench in both cases stated that they considered the offence a serious one, and commented on the risk of infecting other sheep at the yards.

How Victorian Farmers Can Help The Fighting Services

"PORK and beans" and "baked beans" are an important article of diet for the Defence Forces at home and overseas. The bean used is a small, white, dried bean known to canners as the Navy Bean. Australian supplies hitherto have been imported, but it is now urgently necessary to grow more than 100,000 bushels this season in Australia.

The Chairman of the Commonwealth Foodstuffs Committee (Mr. Massey) has said that "millions of pounds of navy beans will be required within the next twelve months to ensure a regular supply of raw material. I consider it essential that every encouragement should be given to local growers to produce these beans in Australia."

The Government has secured sufficient seed to plant an area of 3,000 acres, of which Victoria has been asked to grow at least 1,500 acres. In addition, the civilian demand would probably require a similar acreage. An appeal is made to Victorian farmers located in suitable districts to grow as large an area of these beans as possible, as a form of national service.

The Department of Supply and Development is prepared to pay 20s. per bushel of 60 lb. for commercial grade navy beans and will supply the seed required, deducting its cost (at the rate of 20s. per bushel) from the crop returns.

On this basis the crop should prove a payable proposition.

Suitable Growing Conditions.

The Victorian Department of Agriculture conducted experiments in many parts of the State last year, a total of 38 small plots being planted. The beans grew well over a considerable range of soils and climates. Most soils of the free working type appeared to be suitable. Favorable localities included Orbost, Bairnsdale, Neerim and Koo-wee-rup Swamp, Dandenong Ranges, Daylesford, Koroit, Beech Forest, Beechworth, Whitfield, and, in the Northern irrigation country, Woorinen.

Climatic requirements are a well distributed rainfall up to the time the pods are developed and a dry harvesting period.

Any district which has previously grown peas and beans successfully would seem suitable.

In the non-irrigated parts of Victoria the most favorable time to sow appears to be as early as frosts will permit, say, in late September or October. This would allow harvesting in February–March, when dry weather could be expected. In the North, under irrigation, sowings could be made as late as January.

It was found that the beans suffer from heavy wind and require reasonably sheltered conditions. Where the site is exposed interplanting is recommended with sunflowers, maize, rye-corn or barley in narrow strips, say, half to one chain apart. Where no breakwind is planted the rows should run in the direction of the prevailing winds. The plantation should be protected against rabbits, which may cause heavy damage.

Sowing.

The beans should be sown by drill, the rate of seeding being 30–35 lb. per acre. The ordinary grain, maize, onion and pea drills have all been successfully used with the necessary adjustments, and the "Planet Junior" type of hand drill is satisfactory for small areas. The distance between the rows depends on the type of cultivator possessed by the grower. Drills should be set to drop seed about 6 inches apart with rows 30 inches apart in most districts, though, at Orbost, closer planting in the rows with 3 to 4 feet between the rows has been practised. Wider row spacing enables tall weeds to be controlled more efficiently. Sowing should be 1½ to 2 inches deep, or in very light soils up to 3 inches. The plot must be worked up to a fine tilth, free from clods, before sowing.

Manuring.

Experience suggests that on soils which show a response to manures a dressing of 2 cwt. of a mixture containing two parts of superphosphate and one part of sulphate of ammonia would be desirable. This manure should not come in contact with the seed.

Cultivation.

Intertillage should be given to control weeds. Clean cultivation has a marked effect on yield and soil moisture. Artificial watering should be at intervals of not more than three weeks in irrigation districts and should be followed by cultivation.

Harvesting.

The beans should be left to mature until the plant turns yellow and the leaves dry off and fall. Even at this stage the seed is in no danger of falling, and if it has been well grown, without check through drought or wind damage, the pods will be found to mature together.

In harvesting, the plants may be pulled by hand, skim-plowed out, or mowed by a hay mower.

Curing.

Before removal from the paddock and before threshing, the beans should be raked into windrows and thoroughly dried in the field. This is the most critical time of the harvest, for, if rain comes at this stage, the windrows must be turned over to prevent damage of seed by staining or mould in the lower layers.

Threshing.

After curing, the beans may be threshed immediately or stacked under cover. Here, again, it is necessary to avoid wetting of the stacks, but if this occurs, the stack must be spread immediately to dry rapidly. The beans are easily threshed. For small lots, flailing or rolling with a light farm roller on sheets is quite satisfactory. For larger areas, the pea thresher is excellent, but any type of threshing machine can be adapted easily. Care should be taken that the right speed is used to avoid breaking the bean seed, and dust must be guarded against to avoid soiling the beans at this stage.

Winnowing and Grading.

Good quality commercial seed must be free from broken, stained or shrivelled (immature) beans and foreign matter, and of an even size. The small farm winnower and grader of the "Little Wonder" type is suitable, and grading may not be necessary where the crop has been well grown without check. Winnowing and grading may be done in Melbourne at a cost of 1s. 6d. to 3s. per bag. The amount of work and the cost of such cleaning and grading to produce a commercial sample are largely dependent on the care exercised in growing, harvesting and threshing. Stained and discoloured beans, usually caused by damp, have to be removed by hand picking.

The graded seed should be packed in clean bags to avoid soiling.

Yield.

The limited experience to date suggests that these beans are heavier in yield than peas under similar conditions. Returns last year ranged from 60 bushels per acre to 30 bushels when crops were not damaged, and 30 bushels per acre seems a reasonable expectation.

Applications for contracts by farmers in Victoria desiring to plant should be made in writing to the Victorian Department of Agriculture, Treasury Gardens, Melbourne.

Feeding Cereals to Pigs

Importance of Protein Supplements

By J. A. Morrow, B.Agr.Sc., Manager, Rutherglen Experiment Farm, and S. H. Edwards, Field Assistant

LARGE numbers of pigs are produced by wheat and barley growers. Their object is to obtain greater net returns by marketing their grain through the porker or baconer than they could by delivering the grain itself, and also to dispose profitably of such skim milk as is available. Sharp fluctuations in pig prices occur from time to time, and have been particularly severe in the last nine months, due to the export and shipping position. The local consumer, however, continues to provide a steady market. Many cereal growers with time and labour available will no doubt continue to meet part of the demand, but the extent of the production of pig meat on cereal farms naturally depends on the respective relative prices of grain and pigs.

Whatever the market position may be, it is most important for economical production that the grain diet be balanced by the feeding of protein in some form, the supplements most commonly available being skim milk and meat meal. On the other hand, the production of pigs on skim milk without supplementary feeding of grain is also uneconomical, although the dairy farmer is often disinclined to pay high prices for meals or grains. The extent to which supplementary feeding is economical also depends on relative prices of foods and pigs, and, in fact, cannot be set down by a fixed formula.

Detailed information and recommendations on pig feeding and raising methods are given in a publication issued by the Department of Agriculture entitled "*Pig Feeding.*" This pamphlet is available free of charge on application to the Director, Department of Agriculture, Melbourne, C.2.

The importance of feeding a fairly well-balanced diet is clearly shown by the results of the demonstration recently conducted at the Rutherglen Experiment Farm, where 70 pigs were divided

systematically into three groups at the weaner stage, and then fed either on unlimited crushed grain alone, grain plus limited skim milk, or grain plus limited meat meal. Crushed barley was used in the first section of the test and crushed wheat in the second.

As was to be expected, the results show a significant improvement in the rate of growth and the return of pork per bushel of grain fed when such small quantities as one half-gallon of skim milk or one-quarter pound of meat meal per pig were fed daily.

On a cereal farm where skim milk may be available only in limited and irregular quantities, some protein-rich supplement like meat meal provides a suitable substitute.

Better returns could have been obtained by many and varied additions to the diet, but the object was to measure the effect of these simple treatments and to show just how wasteful it is to feed grain alone.

The detailed results of the demonstration are given in the accompanying table, the outstanding feature being that, using normal values, the net return per pig when feeding crushed grain alone was only about 7s., while the addition to the diet of one half-gallon of skim milk daily, increased the return to approximately 18s., and the use of one quarter-pound meat meal daily resulted in a return of from 13s. to 17s. As these figures allow for food costs only, and do not include consideration of labour involved or overhead costs, it will be seen that the feeding of grain alone could easily result in actual loss, even with pork valued at 6d. per lb. on the farm.

Detailed Results.

Stock.—The 70 pigs used in the trials were bred on the Farm from Large White x Middle White sows, and sired by a large White boar. They were born and reared to the weaner stage in intensive pens, until then being fed skim milk with crushed wheat and barley to supplement the sow's milk.

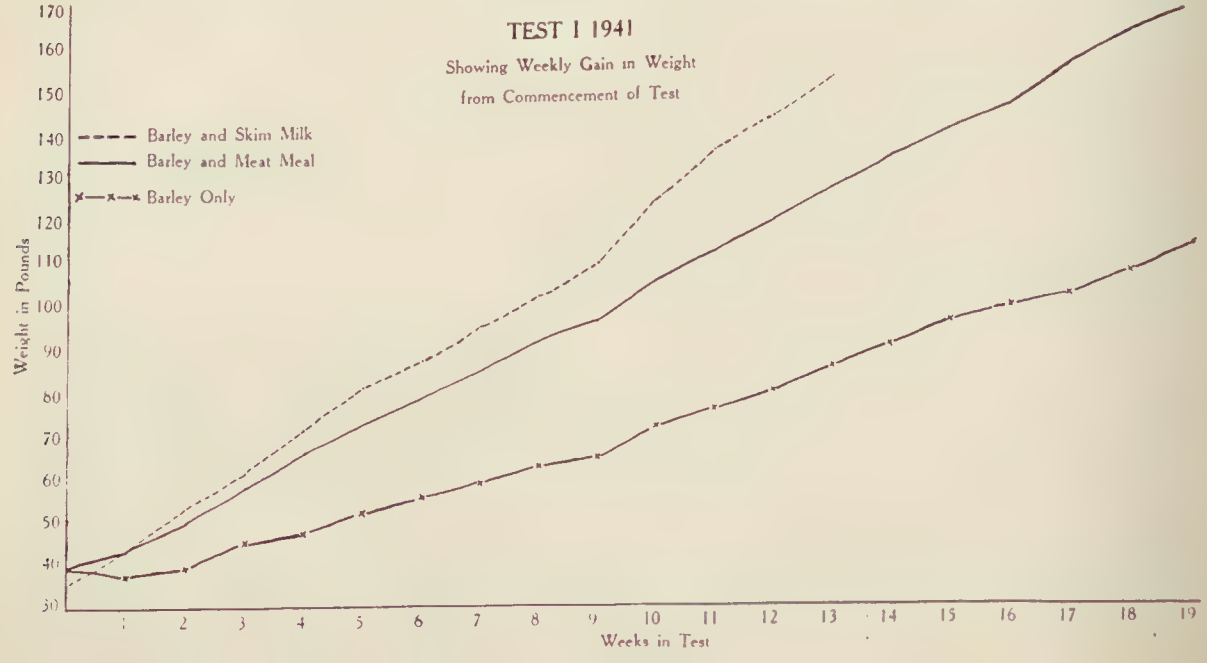
Each group of pigs in the trial was comprised of pigs representing several litters, so arranged that the groups fed on each food treatment were comparable in weights and breeding as they commenced the tests at about eight weeks old.

Accommodation.—Each group of pigs was run in a small paddock carrying fair pasture at the commencement of the test, This pasture quickly deteriorated in quantity and quality due to the dry weather and grazing by the pigs.

A shelter shed of simple design was provided in each paddock, and water was always available.

Food Treatment.—Groups 1, 2, and 3 were given free access to self feeders containing crushed barley, and to a trough containing a mixture of 4 lb. ground limestone to 1 lb. of salt.

Group 1 was given, in addition, ½ gallon of separated milk per pig daily. Group 2 was given ¼ lb. of meatmeal per pig daily, the percentage of meat meal to total food consumed over the period of the test being 7·1 per cent.



No protein supplement was given to Group 3.

In the second series, the pigs were fed on crushed wheat instead of barley, but since the pigs were from different litters, and the test was conducted a month later under altered weather and pasture conditions, the results are not strictly comparable in regard to the returns from barley as against wheat.

Comment on Results.

From the commencement of the test it was evident that the pigs fed with skim milk as a supplementary feed were developing the quickest. Those having meat meal were not very far behind, but the groups fed on grain alone were soon unrecognizable as having been chosen from the same litters.

	Series 1.—Barley Fed.			Series 2.—Wheat Fed.		
	Group 1.	Group 2.	Group 3.	Group. 4.	Group. 5.	Group 6.
	Crushed. barley and skim milk. ½ gal. daily.	Crushed. barley and meatmeal. ¼ lb. daily.	Crushed. barley. No supplements.	Crushed. wheat and skim milk. ½ gal. daily.	Crushed. wheat and meatmeal. ¼ lb. daily.	Crushed. wheat. No supplements.
No. of pigs	16	13	14	9	9	9
Average weight at commencement	31·7 lb.	34·7 lb.	30·7 lb.	38·5 lb.	37·0 lb.	37·0 lb.
Average number of days in test	91	119	124	78	79	81
Average finishing weight ..	137·5 lb.	142·3 lb.	86·6 lb.	133·4 lb.	122·2 lb.	71·2 lb.
Average gain per pig ..	105·8 lb.	107·6 lb.	55·9 lb.	94·9 lb.	87·2 lb.	34·2 lb.
Average daily gain per pig ..	1·2 lb.	0·9 lb.	0·5 lb.	1·2 lb.	1·1 lb.	0·4 lb.
Average daily grain consumption	3·2 lb.	3·2 lb.	1·7 lb.	3·0 lb,	2·8 lb.	1·8 lb.
Grain fed per 100 lb. live weight gain	271 lb.	352 lb.	446 lb.	248 lb.	259 lb.	416 lb.
Supplementary protein feed per 100 lb. live weight gain ..	42·8 gals.	28·4 lbs.	..	40·2 gals.	23·5 lb.	..
Gain per bushel grain fed ..	18·4 lb.	14·2 lb.	11·2 lb.	24·2 lb.	23·1 lb.	14·4 lb.
Total grain consumed ..	4,592 lb.	4,925 lb.	3,054 lb.	2,114 lb.	1,983 lb.	1,285 lb.
Total supplement consumed ..	725 gals.	381 lb.	..	343 gals.	178½ lb.	..
Total weight of pigs at commencement ..	507 lb.	451 lb.	427 lb.	347 lb.	335 lb.	332 lb.
Total finishing weight ..	2,200 lb.	1,850 lb.	1,212 lb.	1,201 lb.	1,100 lb.	641 lb.

Groups 4, 5, and 6 were fed on crushed wheat instead of the barley, and were given free access to self feeders containing the wheat, and to a trough containing a mixture of 4 lb. of ground limestone and 1 lb. of salt.

Group 4 was given ½ gallon of separated milk per pig daily, and Group 5, ¼ lb. of meat meal per pig daily.

No protein supplement was fed to Group 6.

The meat meal fed contained 60 per cent. crude protein. One quarter-pound of this meat meal contains approximately the same amount of crude protein as ½ gallon of skim milk, but the latter would be somewhat superior in its digestible protein content, both in quantity and quality.

The Cape barley used was of good average feed quality, and the wheat sample was good, containing as usual less fibre percentage than the barley.

The above tables summarize the growth rate and food consumption of each group.

The rate of growth of a sub-section weighed weekly of groups 1, 2 and 3, is shown in the graph on the previous page which indicates that after thirteen weeks in the test the barley and skim milk group had reached an average weight of 152 lb. They were marketed at this stage, as they would have become too fat if kept for a longer period. The group fed on barley and meat meal made slower growth, but on the whole were not as fat as the former group. This lot was marketed at an average weight of 170 lb. after nineteen weeks in the test. At this time the pigs of this sub-section fed on barley alone weighed only 112 lb., and obviously would have taken many weeks to reach much greater weight. They were, therefore, marketed. The pigs receiving supplementary protein feed had a greater appetite than those fed grain alone. This is shown by the grain consumption per day which in the barley-fed group was 3·2 lb. when either skim milk or meat meal was supplied and only 1·7 lb. in the "grain only" group.

In a test of this type it is difficult to decide at what stage the pigs should be marketed, but the information tabulated indicates quite clearly the effects of the supplementary protein feed. The table shows also that the gain in weight per bushel of grain fed (barley) was greatest in the skim milk lot (18·4 lb.), whereas the meat meal group gained 14·2 lb. and the "grain alone" group only 11 lb. per bushel of grain fed.

Although the second series was conducted under slightly different conditions and with pigs from different litters, it was evident that greater gains per lb. of grain fed would be made with wheat than with barley. The actual figures were 24·2 lb. gain in weight per bushel of wheat fed in group 4 with skim milk, 23·1 lb. in group 5 with meat meal, and 14·4 lb. in group 6 with wheat only. It must be remembered that there is 60 lb. in a bushel of wheat as against 50 lb. for barley.

It is interesting to note that the meat-meal group approached more closely to the skim-milk group when wheat was fed in place of barley.

Monetary Returns.

Since quality and type govern, to a large extent, the cash value of the pig when marketed, it is difficult to express in monetary terms the relative merits of the feeding methods adopted. Also with varying market prices of the feed and pig products a definite comparison to cover all conditions is impossible. An indication of the returns which may be expected is obtained by adopting an arbitrary scale of prices which can be adjusted according to the conditions under which any particular lot of pigs is raised.

In the accompanying table the following values on the farm were used—

Skim milk ..	.. 1d. per gallon.
Meat meal ..	.. 1½d. per lb.
Crushed barley	.. 3s. per bushel.
Crushed wheat	.. 3s. 6d. per bushel.
Pork ..	.. 6d. per lb.

Valuing the weaners at the commencement of the trial at 10s., and estimating the dressed weight with pork valued at 6d. per lb. on the farm, the return per pig from Group 1 would be :—

GROUP 1, (16 pigs).

	£ s. d.	£ s. d.
Value of meat.—2,200 lb. live weight = 1,540 lb. dressed weight at 6d. per lb.		38 10 0
Less value of weaners, 16 at 10s.		8 0 0
Value of increase		30 10 0
Feed cost.—91·8 bus. barley at 3s. per bushel ..	13 15 5	
725 gals. skim milk at 1d. per gallon	3 0 5	
		16 15 10
Net return		13 14 2

Return per pig, 17s. 1d.

Using similar valuations for each lot the returns per pig would be as shown in the table hereunder :—

SERIES 1.—BARLEY FEEDING.

Group.	—	No. of pigs.	Increase in value.	Cost of feed.	Nett return.	Nett return per pig.
			£ s. d.	£ s. d.	£ s. d.	£ s. d.
1	Crushed barley and skim milk ½ gallon daily	16	30 10 0	16 15 10	13 14 2	0 17 1
2	Crushed barley and meatmeal ¼ lb. daily	13	25 17 6	17 3 1	8 14 4	0 13 5
3	Crushed barley only	14	14 4 2	9 3 4	5 0 10	0 7 2½

SERIES 2.—WHEAT FEEDING.

4	Crushed wheat and skim milk ½ gallon daily	9	16 10 4	7 11 11	8 18 5	0 19 10
5	Crushed wheat and meatmeal ¼ lb. daily	9	14 15 0	6 18 0	7 17 0	0 17 5
6	Crushed wheat only	9	6 14 6	3 15 0	2 19 6	0 6 7

NOTE.—Labor and overhead costs are not included.

It is often assumed that the labour and overhead costs are approximately 10s. per pig where labour is charged at ruling rates. However, it may be that labour is available which would not be otherwise engaged, and therefore under some conditions the figure of 10s. would be higher than it is necessary to charge. However, even supposing that these costs amount to only 7s. per pig, it will be seen that, on the basis of the above food costs the production of pigs feeding by the "grain only" method would be unprofitable, whereas a small margin of profit would accrue where balanced feeding methods are used. These would be greater than shown in the case of the skim-milk group if the skim milk would not otherwise have had a value of 1d. per gallon.

The returns naturally would be less had it been necessary to purchase the wheat at, say, 4s. 2d. per bushel from a neighbouring farm. Similarly, if the barley had been purchased this year at, say, 3s. 7d. per bushel, again the returns would be decreased.

Conclusions.

(1) The addition of ½ gallon of skim milk, or ¼ lb. meat meal, per pig daily, to the diet of wheat or barley, gave large increases in the returns of pork per bushel of grain fed.

(2) The addition of skim milk or meat meal resulted in a much faster rate of growth than when the grain was fed without protein-rich supplement.

(3) A half gallon of skim milk per pig daily was more effective than a ¼ lb. of meat meal per pig daily in balancing the diet.

(4) The production of pigs by feeding grain alone is most uneconomical.

Tubercle Free Herds

The following herds have been declared free of tuberculosis under the scheme conducted by the Department of Agriculture. Under this scheme a tuberculosis-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests, or upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

ACCREDITED TUBERCLE FREE HERDS.

Name.	Address.	Number in Herd.	Name.	Address.	Number in Herd.
Ballarat Mental Hosp...	Ballarat	78	Onley, W. H. ..	"Glenholme," Caldermeade	64
Banyule Stud Pty. Ltd.	Heidelberg	38			
Dennis, Mrs. A. A. ..	Frankston	33	Payne, A. E. T. ..	"Yarra View," Lilydale	77
Dookie Agricultural College	Dookie	78	Payne, T. E. N. ..	"Woodburn," Kilmore	58
Dunbar and Clark, Messrs.	"Hazeldean Dairy," Mount Dandenong	15	Powell, T. S. ..	"Carellen," Mansfield	41
Geelong Grammar School	Corio	58	Reid, Ralph G. ..	"Holmwood," Koowee-rup	78
Gorman, A. W. ..	"Cathcart," Alexandra	61	Richardson Bros., Messrs.	"Faldinghurst," Upper Beaconsfield ..	30
Henderson, J. L. and E. I.	Wangaratta ..	95	Samuel, B. T. ..	Lang Lang ..	60
Holloway, R. W. ..	Caldermeade ...	56	School of Horticulture..	Burnley	8
Lawrence, P. H. ..	"Rainga," Tarrawarra	60	State Experiment Farm	Rutherglen ..	51
Longerenong Agricultural College	Dooen	47	State Research Farm ..	Werribee	211

In addition to the above-mentioned herds there are 125 commercial dairy herds containing 4,333 head of cattle which may be considered free of tuberculosis. All these herds have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds, they cannot be considered as accredited under the accreditation scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

There are also 91 herds in which 4,590 head of cattle have passed one test, and may be considered, therefore to be in process of becoming tuberculosis-free herds.

9492/41.—3

Blossom Killing Sprays for Apple Crop Restriction

by
Frank M. Read, M.Agr.Sc., Chief Inspector of Horticulture

MANY detailed experiments on the removal of blossoms by spraying have been conducted in recent years, principally in America; but the following short account is not the record of a precise experiment, nor do the results form the basis of a general departmental recommendation. However, the writer has been asked by many people to describe what occurred when last season he was associated with the removal of blossoms from a commercial orchard of 1,000 trees in the Ringwood district, adjacent to Melbourne.

Jonathan apple showing 5 to 10 per cent. blossom. Spraying for blossom removal should be done when about half this blossom is showing.

It happened that a well-known orchardist found himself short of labour in the winter of 1940 and uncertain as to the economic position of apple growing. He, therefore, decided to economize by not pruning his orchard, to remove the crop by spraying the blossoms and to turn his energies in another direction. Just before the blossoming period, therefore, he asked the writer what spray he should use and learned with some surprise that to such a question there was no easy answer, for only very occasional attempts have been made in Victoria to remove blossom, with bluestone mainly, and results have been very variable. The fundamental difficulty of blossom killing by sprays is that one is trying to kill some tree tissues without seriously injuring the remainder.

Preliminary Trials.

Preliminary trials of a number of sprays were made on 17th September on duplicate individual limbs of trees of the variety Ballarat to test both efficiency in killing blossom and injurious effect on leaves, buds, and bark.

Cresyllic Acid was tried at concentrations of ¼ per cent., ½ per cent., 1 per cent., 2 per cent., 3 per cent. The best concentration was 1 per cent. for it killed all blossoms without apparent injury to other organs. Lower concentrations were not quite successful and higher ones gave a red tinge to the bark which looked as though it might be permanently injured.

Tar Distillate at strengths of 1 in 30, 1 in 60, 1 in 120, of the commercial spray concentrate was not effective in killing all blossoms but rather surprisingly did not obviously injure the leaves and bark.

Sodium Nitrate in concentrates of 2½ per cent., 5 per cent., and 10 per cent. was not effective in killing all blossoms and gave to leaves and bark a harsh appearance. It is of interest to record in passing that at no time did these trees appear to benefit in leaf colour from the application of nitrogen.

As a result of these trials it was decided that cresyllic acid 1 per cent. looked the most promising, and arrangements were made for a Melbourne manufacturer of spray materials to make up a gallon at 50 per cent. concentration in the form in which it would actually be supplied commercially. One gallon of this material costing about 10s. in 50 gallons of water makes

These apple blossoms are too advanced for blossom removal by spraying. The petals shield the flower stalks.

a 1 per cent. solution. One complete tree of the same variety, Ballarat, was thoroughly sprayed with this material on 4th October when the trees were about three-quarters full bloom. Another complete tree was sprayed with the original 1 per cent. solution made up by the Agricultural Research Chemist. In both cases the results were quite satisfactory, all the blossom appeared killed and no appreciable damage was done to other parts. Actually these trees carried only two and three apples respectively, instead of probably at least four cases per tree. Smaller trials were made on Yates, Jonathan, Granny Smith, and Delicious and were successful though the Jonathan leaves were all marginally scorched.

Spraying the Orchard.

Supplies of the commercial product were, therefore, immediately ordered and the spraying of the whole orchard was carried out on 10th–12th October. The preliminary trials suggested that we were a little late for best results. The optimum stage is discussed later. Very thorough spraying was seen to be necessary, any branches incompletely sprayed were soon discernible by uninjured petals. The orchard of 1,000 trees which are mainly well-grown specimens fifteen to sixteen years old required 3,000 gallons of spray.

The cost of spray material, labour, and plant running charges for the 1,000 trees averaged 8·6 pence per tree, while the cost of removing by hand later in the season fruit not destroyed by the spray averaged 2·4 pence per tree making a total cost of 11d. per tree. This must be considered a very reasonable cost, for the trees were showing such heavy blossom that they would probably have carried a crop varying from four to ten cases per tree even if they had been pruned. By comparison nine Yates trees, which were not sprayed, cost 2s. per tree to strip by hand and no time was lost in this operation.

Varietal Differences.

The above figures based on records kept by the grower give, I think, the best general idea of the effectiveness of the sprays. Actually, there were differences between varieties estimated approximately as follows:—

In Granny Smith and Ballarat about 5 per cent. of a normal crop had to be removed by hand. In Yates and Jonathan about 10 per cent. of the normal crop had to be removed by hand. In Statesman the spray was a failure, and though all apples carried were blemished they persisted. It will be interesting and important to see if this is always the case with this variety, and further work on timing and strength of the spray is necessary. No obvious reason for the failure can be stated as a result of observations made. In all of the successful varieties, but especially in Yates and Jonathan, fruit dropped up to December, particularly in periods of heat and strong wind. Thus the final result was better than the appearance of the trees a week or two after spraying suggested.

Time to Spray.

Though no precise trials were made observations on hundreds of blossoms indicated definitely that the full bloom stage or even half-full bloom was too late. Though petals were quickly killed the

An ideal stage in apples for blossom removal by spraying.

blossoms set. The pedicel or flower stalk seems the vulnerable spot to aim at and the petals probably protect it. *The cluster bud shown in the early green and late pink stages in the illustrations should be attacked.* As a general guide spraying should be done when a few open flowers are seen. Practically all blooms will then be in the cluster bud condition. It is, of course, not possible in practice to have all blooms in the ideal stage, as they vary in development.

Tree Injury.

No injury worth worrying about occurred and none persisted. There were certain differences, however, from one variety to another. Leaf injury was not present in Yates. Though the leaves were well developed at spraying they showed absolutely no sign of spray effect. It was noticeable but not important in Ballarat and Statesman. In Granny Smith the leaves were definitely injured around the margins and somewhat harsh, while Jonathan suffered most leaf injury of all. Most of the young leaves were injured and fell, a new lot of leaves being grown. However, in no case did the injury seriously affect the trees though Jonathans were checked in growth. At the present time with the 1941 pruning just completed the trees are in normal health and showing plenty of blossom buds. Recent inspections have shown further that none of the spray injury to bark and buds from the preliminary experiments is now noticeable. Even where 3 per cent. cresyllic acid was used the bark seems normal so that some margin of safety exists over the 1 per cent. solution. However, these injured parts were sheltered by the rest of the tree and recovery would thus be aided. Sprays of greater strength than 1 per cent. should be tried with caution.

In conclusion it is again emphasized that this account should not be taken as a general recommendation but simply a fair statement of one substantial practical experience, which will be of interest at the present juncture. The Department will make more extensive trials in the coming season.

Accredited Brucellosis-free Herds (Swine).

The following herds of pigs have been accredited as free of swine brucellosis (contagious abortion of pigs) by the Department of Agriculture.

An accredited brucellosis-free herd of pigs is one in which all animals therein have been subjected to two successive blood tests for brucellosis with negative results at intervals prescribed by the Chief Veterinary Inspector of the Department.

In order to remain accredited, a semi-annual or annual re-test (as determined by the Chief Veterinary Inspector) of all animals in the herd shall be conducted. If at a re-test any animal fails to give a negative reaction to the test, the herd shall not be declared brucellosis-free again until two tests of the complete herd have been carried out with negative results.

Full particulars of the Accredited Swine Brucellosis-free Herd Scheme and application forms may be obtained from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Name.	Address.	Name.	Address.
Bright, George H. ..	Dumbalk	Rintoul, J. T. C. ..	Glengarry
Castle, L. H.	Clarinda	Roy, W. A.	Morrell's Hill, via Boolarra
Doornbusch, John L. ..	"Starpark", Nhill	State Experiment Farm	Rutherglen
Fairchild and Clutterbuck, Messrs	Tinamba	Trenery and Soderlund, Messrs	"Promview", Foster
Harrison, C. T. ..	"Eastside" Stud, Pomborneit	Trigg, A. J.	Bungaree
Hawkin, J. E. & F. ..	"Rossmoyne", Colac.	Trigg, N. H.	Bullarook

Budding, Grafting, and Methods of Re-working Fruit Trees

By

J. L. PROVAN, B.Agr.Sc., Senior Horticultural Instructor, and F. J. GREATOREX, Orchard Supervisor

The first and second instalments of this article appeared in the July and August issues of the Journa

Re-working (continued).

WHATEVER form of grafting is to be done a supply of suitable wood for grafting scions must be obtained some weeks prior to the commencement of the operation.

Selection and Cutting of Scion-wood.

Although grafting is performed generally in the spring, either just before or after the *stock* has commenced to grow, it is essential that the *scions should be quite dormant*, and they, therefore, must be obtained before sap movement occurs in the parent tree, and kept dormant, but alive, until they are used. Winter pruning time is usually the most convenient period to obtain scion-wood.

However, it is very advisable that parent trees should be selected and labelled during the summer or autumn when health and cropping capacity can be observed. Freedom from insect pests, fungous and virus diseases and trueness to type are also desirable characteristics in a parent tree. Apple trees showing symptoms of variegation (mottling) and citrus trees affected with Scaly Bark (*Psorosis*) should be avoided.

Shoots which were produced during the previous growing season should be selected for scion-wood for the majority of deciduous fruit-tree grafts. When grafting peach, fig, and walnut trees, it is desirable to choose two-year-old wood, or the basal part at least of the scion should be two-year-old wood.

Fig. 20.—A bundle of suitable scion-wood.

Scion-wood must have growth buds on it. The type of grafting to be done determines the thickness of the wood selected. For framework grafts, such as the "Needle" and the "Gouge," wood not thicker than an ordinary lead pencil should be selected for scions. Wood of the same size, or slightly larger, is suitable for all other types of grafting.

Suitable scion-wood should be cut from the dormant tree, gathered up immediately, arranged so that all the basal ends are together, tied in bundles of a convenient size, and each bundle labelled with the name of the variety (Fig. 20). The label should be weather-proof. A convenient label is a small piece of galvanized iron fitted with a piece of fine wire so that it can be attached to the bundle. This label is best written on with a sharp metal point.

Transport and Storage of Scion-wood.

As grafting scion-wood is dormant, it is not necessary to exercise as much care as in the handling of bud-sticks. It should be protected from mechanical damage in transport, and if the transit period is likely to exceed a week, wet paper or sphagnum moss should be packed around the basal ends to prevent shrivelling.

In order to keep scion-wood dormant until it is used, it may be "heeled in," buried, or cool-stored. "Heeling in" consists of untying the bundles and burying the basal ends of the shoots in moist, well-drained soil in a shady place (Fig. 21). Alternatively, the bundles

Fig. 21.—Scion-wood heeled into the soil.

may be wrapped in hessian and buried horizontally about 3 inches deep in a similar situation. These methods are satisfactory for holding scions which are to be used for early grafting.

Scion-wood may be kept for considerable periods in cool storage, and this method is advisable if facilities are readily available. For periods up to three months, the wood may be left in bundles or packed bare in boxes. For long periods it should be packed in moist sand in boxes. It should not be stored below a temperature of 32 deg. Fahrenheit.

If scion-wood shrivels, it should be stood in water until it revives. If "heeled in" or buried scion-wood commences to grow, it should be removed from the soil for a day of two and then replaced. This will check its growth.

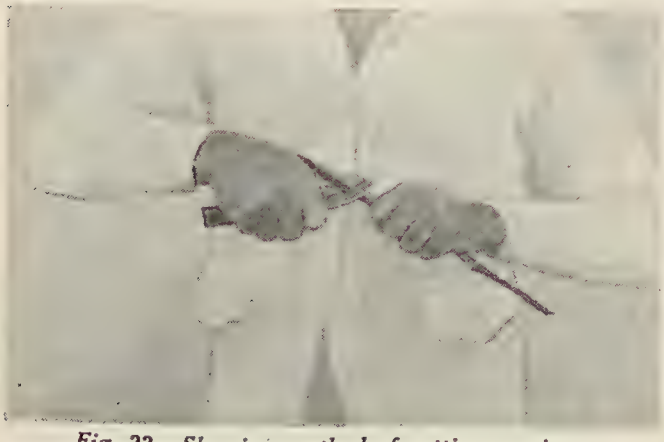


Fig. 22.—Showing method of cutting a scion.

The Technique of Cutting Scions.

Scions and stocks are cut to expose portions of the cambial region, and these surfaces are placed in contact with one another. As a general rule, it can be stated that the larger the area of contact between the cambial regions of the scion and stock the more successful will be the graft. All cuts on scion and stock, therefore, must be made in such a manner that, when the scion is inserted in the stock, no irregularities in the surfaces will prevent proper contact. This is a very important point in grafting. All cuts must be clean, smooth, and fit the contacting surface.

Fig. 23.—An apple tree successfully top-worked by bark grafts.

There is one first cut made for all grafting scions, except strap graft scions. That cut produces a sloping surface, and the method of making it will be described here. Fig. 22 shows this first step. The scion-wood is held firmly in the left hand with the thumb supporting it and the base of the thumb pressed against the body. If the hand is held away from the body, the grafter has not the same control when making the cut. The base of the shoot points toward the right shoulder. The action of the right arm when making the cut can be best described as an "elbowing"

movement. This results in a slicing action with the knife and produces a good surface on the scion. The further preparation of the scion varies with the graft, and details will be given later under the name of each graft.

Top-working.

This term has been defined previously (p. 394, August *Journal*), and the advantages and disadvantages of the method have been stated. The top of the tree to be re-worked is removed back to the trunk or to short stubs of the main branches.

Fig. 24.—A peach tree eight years after being top-worked by means of cleft grafts. The arrow indicates the position of grafts.

Bark grafting can be commenced as soon as the bark can be separated easily from the wood of the stock. Cleft and whip-tongue grafting can be performed slightly earlier. In New South Wales, Whittaker and Thornell (4), using bark and cleft grafts, have shown that better results with stone-fruit trees are obtained when the trees are grafted before growth commences, even if the bark has to be forced from the wood by a wedge.

Preparation of the Stock.

The stock is prepared in the same manner for all top-working, with the exception of very young trees in which the trunk or main leaders are less than 1 inch in diameter and therefore suitable for whip-tongue grafting. Almost the entire tops of the larger trees to be grafted should be sawn off just prior to the grafting operation. Earlier removal of the tops is not advisable because the wounds are then exposed to fungal infection for an unnecessarily long period. In addition, sap movement commences earlier in trees which are not cut back, which allows grafting to commence slightly earlier than is the case with trees which are cut back in winter.

The tree is beheaded as low as is practicable, so that the future basal fruit-bearing wood of the scion will be nearer to the ground. Three or four well-placed limbs are selected for grafting and the tops of them are sawn off square 12 to 18 inches from the crotch. Any superfluous limbs are removed entirely. When cutting off the selected limbs, the cut should be made where the bark is smooth and free from lateral limbs and knots, and, for cleft grafting, where the grain is straight.

After removing the limbs, all cuts, whether to be grafted or not, should be trimmed smooth with a sharp knife or a spokeshave. This assists callusing of the wounds.

Some small lateral growths or spurs, either on the trunk or on the stubs of the branches, should be left for shade purposes, or some other provision made for shading the trunk. It may be protected from sun-scald by whitewash, by hessian bags wrapped around it, or by a board nailed temporarily on the north-west side of it.

If the limbs of the trees are broken, ill-placed, or otherwise undesirable, the whole top may be removed by sawing through the trunk, the growths from the grafts subsequently forming the crotch and leaders of the future tree. Particular care must be taken in shading a trunk so treated.

Trees small enough to be top-worked with whip-tongue grafts must not be cut back until the actual grafting time. The whole top, or the tops of the selected branches, are removed by making a long, smoothly sloping cut with the grafting knife. These cuts receive the prepared scions, and the cambial rings must not have suffered any drying before the operations are completed.

Fig. 25.—The strap graft showing two scions in position before sealing.

Strap Graft.

This graft derives its name from the strap-like piece of wood and bark of portion of the scion. When the scion is inserted, this strap spans the cut surface of the stock (Fig. 25).

For limbs exceeding 1 inch in diameter, the strap graft is one of the best top-working methods, because the wounds heal more quickly. It has been used extensively for re-working apples and pears, and it could be used also for cherries and plums. This graft requires more skill and takes longer to do than other grafts, but the results warrant its use. It is recommended for young trees up to about eight years old, but it may also be used for older trees. Essentially, it is a modified bark graft, and therefore grafting can commence as soon as the bark of the stock separates easily from the wood, and can continue, providing the scions are suitable, until early November.

Preparation of the Stock.

After cutting back and trimming, the stock is prepared for the insertion of the scion in one of the three following ways:—

(*a*) When the diameter of the stock is small (1 inch to 2 inches) and only one scion is used, a longitudinal cut about 1 inch in length is made in the bark, at the top, on each side of the limb. If necessary, the flaps of bark are raised with the aid of the grafting knife.

(*b*) When the stock is more than 2 inches in diameter and two scions are used, two longitudinal cuts about ½ inch apart are made on each side of the limb and the bark is separated from the wood.

(*c*) When the stock is similar to (*b*) but the scions can be inserted without first cutting the bark of the stock, longitudinal cuts are unnecessary. The prepared ends of the scions are simply forced between the bark and the wood.

Preparation of the Scion.

The length of the shoot selected for the scion should be about 4 inches longer than the diameter of the stock. The strap portion of the scion is made first. The scion-wood is held with the basal end pointing away from the grafter, and a cut is commenced about 1¼ inches below one of the basal buds. This cut resembles a peeling operation and is made only deep enough to peel a thin slice of bark and wood, in length about an inch longer than the diameter of the stock. This strap is then bent upwards, but is not cut off. The piece of scion-wood from which the strap has been cut is removed by making another cut sloping towards the basal end, and on the opposite side from the point where the strap was completed. This latter cut forms a wedge-shaped end about ¾ inch long. About ½ inch of the outside bark is removed from the tip of the strap by a sloping cut (Fig. 26).

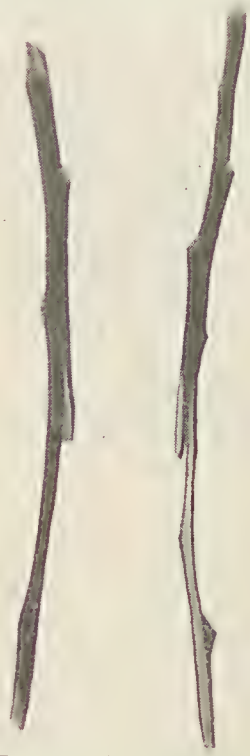


Fig. 26.—Two prepared strap graft scions ready for inserting into the stock.

Insertion of the Scion.

In the case of (*a*) and (*b*) above, the end of the strap is inserted between the bark and the wood on one side of the stock where the

longitudinal cut or cuts have been made. The strap is placed across the cut surface and the wedge-shaped end of the scion is pushed between the bark and the wood where the longitudinal cut was made on the opposite side of the stock, so that the strap lies as close as possible to the stock. The bud near the end of the strap is either pushed under the bark or remains exposed on the horizontal part of the strap. Do not bend the strap at a point where a bud occurs, because it may break. It should always be at a point between two buds.

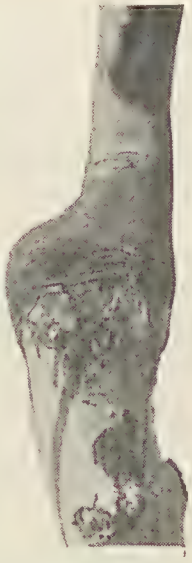


Fig 27.—A strap graft three years after grafting.

When two scions are inserted on each limb of the stock, they are placed so that the straps are parallel and close together, but are reversed in direction (Fig. 25).

When strap grafts are used on limbs more than about 4 inches in diameter, a bark graft, which will be described later, may be inserted on each of the other sides of the limb at right angles to the strap. This ensures rapid covering of the wound.

Tying, Sealing, &c.

The scion, especially the strap portion, is held in position by either tacking or tying. The whole graft is then sealed. About one month after grafting, the ties are cut and some convenient method of support for the new growth should be provided.

Cleft Graft.

So called, because a cleft or split is made in the stock. It is also known as a wedge graft, the basal end of the scion being wedge-shaped. This graft was popular in Victorian horticulture because it was so quickly performed. Its most serious disadvantage is the large split made in the wood, which allows wood-rotting fungi to enter and provides a harbour for insect pests.

It has been used for pome fruits, peaches, cherries and plums, and as it will still be used, particularly in the drier districts where wood-rotting fungi are not so troublesome, a description of this graft is included.

Because this graft does not require the separation of the bark from the wood, it can be commenced earlier in the spring than bark grafts.

Preparation of the Stock.

The stock is cut back and trimmed in the manner described previously. A cleft 2 to 3 inches deep is made with a splitter (Fig. 7, p. 325, July *Journal*) and mallet or hammer, across the centre of the cut surface of the stock, preferably where the wood is straight-grained. A wedge is then placed in this cleft to keep it open until the scions have been inserted. If there is not a wedge-shaped end on the splitter, a large screw-driver or chisel may be used.

Fig. 28.—Peach tree top-worked by cleft graft (at arrow) 8 years ago, on peach.

Preparation of the Scion.

The scion-wood should be about 5 inches long and should have from three to six buds, depending upon the variety. The basal end of the scion is made wedge-shaped by two sloping cuts, each about $1\frac{1}{2}$ to 2 inches long. It is advisable to make these cuts so

Fig. 29.—Two views of the scion used for cleft grafting in top - working and for mid-split cleft in stub grafting.

that a bud is retained on the side of the wedge (Fig 29). In the event of the top part of the scion being broken off accidentally this bud will probably survive and grow. The wedge of the scion should be made slightly thinner on its inside edge. If it is made thicker, good contact between the cambial regions may be prevented.

Insertion of the Scions.

Usually, a scion is inserted at each end of the cleft (Fig. 30). During this operation the cleft is held open by a wedge pushed into the centre of it. Each of the scions is placed in the cleft so that the cambial region of the wedge-shaped portion is in contact with the cambial region of the stock. The outside face of the scion should not be flush with the bark of the stock because this bark is much thicker than that of the scion and therefore the cambia will not be in contact. It is important that the inside edges of the barks should coincide. Sometimes, the scion is tilted slightly so that the cambial region of the scion crosses that of the stock.

Fig. 30.—Cleft graft showing scions in position and one sealed.

Tying, Sealing, &c.

This graft does not require tacking or tying. When the wedge is removed from the cleft the scions are gripped firmly by the wood of the stock. As soon as the operation is completed the wounds should be thoroughly sealed.

Oblique Cleft.

This is a modified cleft graft for use on large limbs. Three or more oblique clefts (Fig. 31) are used instead of the single cleft through the centre of the stock. In all other respects the details of this graft are similar to the ordinary cleft graft.

Whip-tongue Graft.

This graft derives its name from its use for grafting whip-like stocks and from the tongue-like projection formed by the cut made in the sloping face of the stock and scion. This tongue serves two purposes. It holds the scion in position and increases the area of contact between the cambial regions of the scion and the stock. It is a popular and very satisfactory graft for scions and stocks of about the same thickness and less than 1 inch in diameter. Nurserymen use this graft for the propagation of apple trees and also for the working of apples, pears, quinces, plums, cherries, and apricots when the usual dormant budding has been unsuccessful. When properly executed this graft makes a perfect union (Fig. 37). If necessary this graft can be done when both the stock and the scion are dormant, as in bench-grafting or in the field it can be commenced a few weeks before bark-grafting.

Preparation of the Stock and Scion.

The stock is cut back at grafting time by a flat, sloping cut about 1½ inches long. Then a thin transverse cut about ¼ inch long is made in the opposite direction. It should commence

Fig. 31.—Oblique cleft graft before sealing.

Fig. 32.—Whip-tongue graft showing details of scion and stock. Note bud at back of the cut on the scion.

at a point between one-third and half-way down from the top of the sloping cut. The method of making this cut is shown in Fig. 33.

The scion is prepared in a similar manner. The sloping cut should be about the same length as that on the stock and it is usual to make this cut in such a position that a bud is retained at the back of it, about $\frac{1}{2}$ inch from the end of the scion (Fig. 32). The sloping cut of the stock may be longer than the sloping cut of the scion, but it is not advisable to make the latter cut longer than the former. An exposed surface on the stock heals quickly, but the exposed surface of the sloping cut of the scion protruding either above or below the sloping cut on the stock does not heal so readily.

Fig. 33.—Whip-tongue graft showing method of making the tongue-cut in the stock.

A little practice is necessary to determine the correct position in which to make the tongue-cut on the scion. This cut is made similar to the tongue-cut on the stock. It should commence at a point on the scion which corresponds to the completion of the tongue-cut on the stock. When the scion is inserted, if the sloping cuts of the stock and the scion differ in length, or the tongue is not in the correct position, it will be displaced either too high or too low on the stock.

Insertion of the Scion.

The sloping end of the scion is pressed lightly on the sloping surface of the stock just below the tongue. This pressure causes the tongue of the scion to protrude slightly and enables it to be pushed behind the tongue on the stock. When the thickness of the stock is the same as that of the scion the cambial regions on the cut surface of each will be in close contact. If the scion is slightly thinner than the stock it should be placed so that contact is made on one side (Fig. 36).

Fig. 34.—Whip-tongue graft showing method of making the tongue-cut in the scion.

Tying, Sealing, &c.,

One advantage of the tongue in this graft is that it holds the scion in position during the

Fig. 35.—Whip-tongue graft fitted together, tied with raffia, and (right) before tying. Sealing remains to be done.

Fig. 36.—Whip-tongue graft showing method of fitting thin scion to a wide stock. Note position of bud on scion.

tying operation, but care should be exercised to avoid side displacement. Waxed tape is used both to hold and seal this graft. If raffia is used sealing is necessary, unless the graft is buried beneath the soil, as after bench-grafting, or is placed in special callusing conditions. In about a month's time, if healing is satisfactory, the tape is loosened or the raffia cut.

If young stocks are whip-tongue grafted usually three or four shoots arise from the scion. If these are too low to form the head of the future tree then the top growth should be allowed to grow and half of the lower shoots should be cut off. When the top is well established the head is formed and the remains of the lower side shoots are completely removed.

Bark Graft.

This graft is known also as a rind graft. It is called a bark graft because the scion is inserted in the stock between the bark and the wood. It is a simple and quick graft, which has been used successfully in Victorian orchards. This graft is done most easily when the bark of the stock separates readily from the wood, which occurs just after the tree commences to grow.

Preparation of the Stock.

After the selected limbs are cut off and the stubs trimmed, one or more longitudinal cuts, each about 1 inch long, are made in the bark at the top. The number of cuts made depends upon the size of the stock and the number of scions to be inserted. For a limb about 3 inches in diameter two cuts should be made, one on each side of the cut surface. If a wedge-shaped scion is used it is not necessary to cut the bark of the stock.

Fig. 39.—The bark graft before tying and sealing.

Preparation of the Scion.

The most usual method of preparing the scion is to make one sloping cut about 1½ inches long at the basal end (Fig. 38). The scion should have four or five buds on it and one bud should be situated on the back of the cut surface. Another method is to make the basal end of the scion wedge-shaped by a sloping cut about 1 inch long on each side.

Insertion of the Scion.

The scion with the single sloping cut is pushed down the longitudinal cut on the stock

Fig. 37—Longitudinal section of a whip-tongue graft two years old. Note complete callusing.

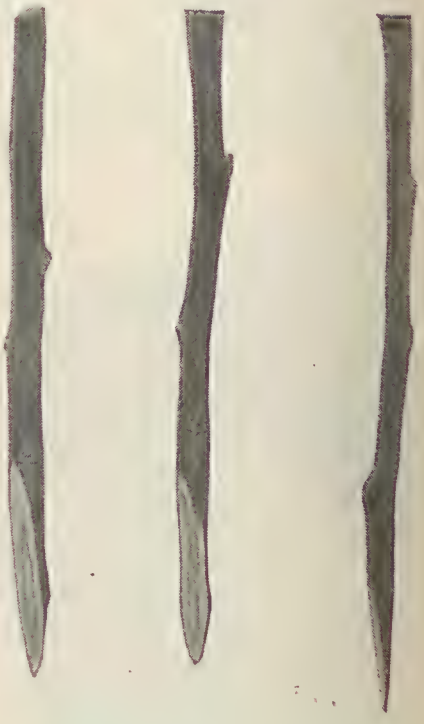


Fig. 38.—Left, scion used for bark graft (top-working) and "T" graft (frame-working); centre, scion used for "L" graft (frame-working), and right, scion used for "needle" graft (frame-working).

so that its surface is pressed against the wood of the stock (Fig. 39). If the wedge-shaped scion is used it is forced between the bark and the wood. Care is necessary to ensure that the scion is not pushed so far down that its uncut surface is resting against the wood below the top of the stock.

Tying, Sealing, &c.

The scions are held firmly in position by tacking or by tying with string or raffia; the graft is then sealed. When the graft is well callused the ties should be cut and supports should be provided for the new growth from the scions. Laths nailed to the limbs of the stock serve as a useful means of support.

Top-working by Budding.

All young deciduous and evergreen fruit trees, as well as walnuts and almonds, can be top-worked by budding. When re-working older trees, one season's growth is lost by using this method because the stock is cut back, and the shoots to be budded must be grown. Except for citrus trees, grafting is preferable to budding when the trees are more than five years old.

Deciduous Trees.

To top-work, by budding, young deciduous trees, buds of the desired variety are inserted in the base of each limb of the stock during summer or autumn. The budding operation has been described in detail previously (see p. 389, August *Journal*). In the following spring all that portion of the stock above the inserted buds is cut off. The new growth from these buds forms the fruit-bearing top of the future tree.

Fig. 40.—Bark graft showing callusing of wound.

Citrus Trees.

In Victorian citrus groves there is still a considerable amount of re-working to do. The chief varieties which should be re-worked are the so-called Australian Navel, Thompson's Improved Navel, and a small number of sweet orange seedlings and mandarins. The scion varieties recommended for re-working these less desirable trees are Washington Navel and Valencia Late oranges, Marsh Seedless grape-fruit, and Lisbon and Eureka lemons.

In Victoria, grafting is not used, either for the propagation or re-working of citrus trees. Budding is the chief method of propagation, and budding into one- or two-year-old wood is used exclusively for re-working established trees.

Citrus trees which are to be re-worked are cut back very heavily in late September or early October. This involves the removal of

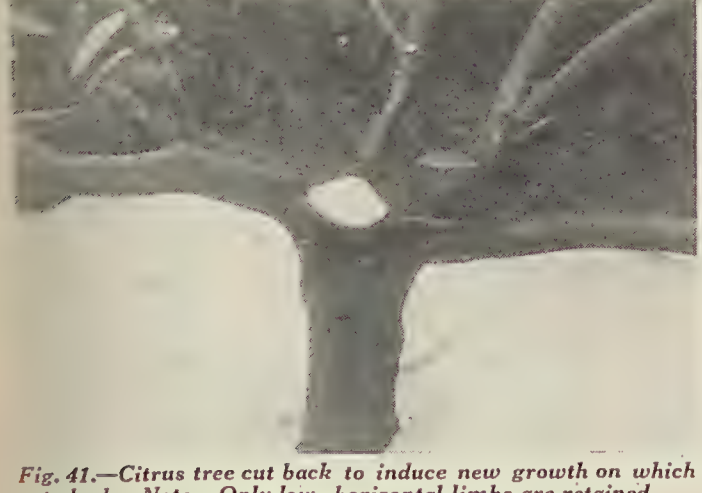


Fig. 41.—Citrus tree cut back to induce new growth on which to bud. Note.—Only low, horizontal limbs are retained.

the entire centre of the tree as close as possible to the main trunk and also the cutting back of many of the lower branches (Fig. 41). Only a few, low, horizontal limbs are retained to act as feeders to the root-system. It is preferable to complete this cutting-back before the middle of October so that the resulting young growth from the trunk and main branches will be sufficiently matured to be budded in the summer or autumn. This young growth appears about three or four weeks after the tree is cut back. Six or eight of these young shoots which are well placed for the formation of the future framework of the tree are retained and the remainder are rubbed off while they are still succulent. These selected shoots grow very vigorously. The trunk and main branches must be carefully protected from sun-scald by nailing hessian bags over them.

In March or April, a bud of the desired variety is inserted in the base of each shoot (see p. 391, August *Journal*). The bud remains dormant during autumn and winter. The following spring (August) the top of the shoot is cut off about 6 inches above the inserted bud. Later, this bud grows and the young tender shoot is tied to the stub above it for support (see Fig. 15, p. 392). The stub and any competing growth from the stock should be removed later. If the buds have made good growth the remaining limbs of the old variety should be cut off next spring, or if preferred they may be retained for another year until the buds have made more top growth.

Reference.

(4) E. C. Whittaker and S. A. Thornell, *Agric. Gaz., N.S.W.*, Vol. LI., Pt. 6, June, 1940.

The foregoing is the third instalment of an article dealing with the subjects of Budding, Grafting and Re-working of Fruit Trees. A further instalment will appear in a subsequent issue of this Journal.

Selection of Specimen Material for Identification of a Plant Disease

If the farmer is contemplating sending specimens of diseased plants to the Department of Agriculture for identification, there are certain points he should observe in the selection of the material.

First of all, the material should show typical symptoms of the disease. It should be as fresh as possible and, so that it will not reach the laboratory in a badly dried condition, should be packed between blotting paper or newspaper.

Secondly, an adequate quantity exhibiting both early and late stages of the disease should be sent. Where possible, whole plants are preferable, as sometimes symptoms in the upper portions have been caused by disorders of the roots or of the collar region.

The last point, which is very important but is frequently overlooked, is to accompany the specimens with a note fully describing the trouble being experienced. Many troubles are not caused by a parasitic organism. Therefore describe the situation and the treatment the plants have received, for, without these facts, no conclusion can be reached about this type of disorder.

Phenothiazine Doses

In the article "Phenothiazine Treatment Against Worms," published in this *Journal* for August (page 366), the dose recommended for grown sheep was given as follows: grown sheep, $\frac{1}{4}$ oz. (25 grammes). The dose however should read: grown sheep, $\frac{3}{4}$ oz. (25 grammes).

Paspalum Ergotism in Cattle

By A. R. GRAYSON, B.V.Sc., Veterinary Officer

DIFFERENT pasture grasses in Victoria are, at times, rendered unsuitable for stock because of the effect produced by varying circumstances, usually seasonal in nature. Such conditions prevailed last autumn, particularly in North-eastern Victoria and in parts of Gippsland. The pasture grasses affected were *Paspalum dilatatum* and the Water Couch grass (*Paspalum distichum*). These grasses, where conditions have proved suitable, have become heavily infested with one of the species of the ergot fungus. There are twenty known species of this fungus—*Claviceps*—and each species attacks only a specific group of host grasses. The species attacking the Paspalum group is *Claviceps paspali*. It has been known in Australia only since 1935, but it is interesting to note that it was first recorded in the Maryland district of the United States in 1902, and that since 1912 Paspalum has been discountenanced as a fodder grass because of its high susceptibility to ergot. Very often other saprophytic moulds or fungi become super-imposed on the ergot infection, and the grass then becomes toxic to stock.

Seed-heads of Paspalum dilatatum infected with Paspalum ergot disease. Note the intense white appearance of the developing fungus on the heads.

Heifer suffering from the effects of Paspalum ergot.
[*N.Z. Jnl. Agric.* photo.

The life history of the fungus ergot is complex, and the first noticeable sign of *Paspalum* or couch grass infection is the presence of sticky glutinous masses in the seed head. This will become very evident if one should walk through affected grass. This stage is known as the "honey-dew" stage, and is not toxic to stock. It is, however, attractive to insects, beetles, blowflies, &c., which assist in the spread of the infection. This stage later develops in the mature ergot, and in *Paspalum* is indicated by the presence of small round and hard bodies where the seeds of the grass should develop.

Continued ingestion of ergot infested paspalum or couch grass produces the following symptoms in dairy cattle. Milk secretion ceases and the affected cows lose condition. They become listless in their movements and do not graze readily. In the early stages there may be some diarrhoea, but this is soon followed by a fairly obstinate impaction. Nervous symptons supervene, and these symptons are typical of the condition. There will be noticed inco-ordination of movement as shown by a staggering gait, twitching of groups of muscles, shivering, a degree of lameness with a possible partial paralysis. The temperature, pulse, and respiration remain comparatively normal, but the coat becomes harsh and the eye staring. There may be also a discharge from both the nostrils and the eyes. If disturbed and forced to move the animal will stagger and often go down, at times falling over backwards. If paralysis is evident, the animal will be unable to rise, and death will supervene from congestion of the lungs, &c. In most cases, however, where no paralysis is evident, the animal, if left alone will manage to rise.

Rye corn heads infected with the rye corn ergot fungus. This fungus is quite distinct from that which attacks Paspalum.

Ergot of Paspalum dilatatum caused by Claviceps paspali. The intense white appearance of the developing ergots is noticeable, particularly in the branch on the left. On the lower right are typical yellowish sub-globose, rough-surfaced mature Paspalum ergots, and on the left is a group of healthy Paspalum seeds.

Recovery is rapid if the animal is at once removed from the affected pasture. The treatment then consists in the administration of a purgative, such as 1 lb. of Epsom salts and 1½ oz. of ginger to 1 quart of water. This may be repeated if necessary. If recovery is slow, it may be assisted by giving a tonic powder, consisting of 1 dram of sulphate of iron, 1 dram of Nux Vomica, 2 oz. of Epsom salts, and 2 drams of Gentian. This powder should be given, mixed with treacle, once daily for three days.

Ergot infected paspalum does not give rise to the condition of gangrene of the extremities as does ergot of rye, nor is there any history of it causing abortions.

The control and prevention are largely wrapped up in good management. As already indicated, couch or paspalum at the honey-dew stage of infection is not poisonous to stock, but the appearance of this stage should be regarded as a warning that trouble will follow. If these grasses can be kept eaten down and not allowed to seed there will be no development of ergot,

[Continued on page 446

Live Stock Notes

Reminders for September—October

Compiled by A. C. T. HEWITT, M.Agr.Sc., Live Stock Science Officer

Dairy Cattle.

EVEN in the winter and spring with frequent rains, heavy dews, succulent pastures containing up to 85 per cent. of moisture, and cool weather, cows and young stock require access to additional drinking water. Clean, fresh, wholesome water is necessary not only to maintain good health, but also to stimulate the appetite and aid in the digestion of food so necessary for milk production and growth. It is desirable that drinking water be laid on to every paddock so that the stock have continual access to it.

Drinking water is best laid on in troughs, although running streams and dams with good approaches, preferably paved, are widely used. The farm water supply is not always given the attention it deserves, and too frequently the stock are either out of water due to blockages, or have so puddled up the approaches to a dam or an overflowing trough that they are in danger of becoming bogged. If noticed early, blockages usually can be cleared before the stock are out of water and overflows stopped before puddling occurs. By using sufficient gravel filling and keeping the drains cleared, the approaches can be kept in good order.

Where the approaches are boggy, the stock may prefer to go without a drink, or perhaps drink water from stagnant pools, rather than wade through the mud for the pure water. Failure of dairy cows to drink sufficient water is soon reflected in a reduced milk yield.

Small young stock and calves may not be able to wade through the mud to the water, and be forced to get along as best they can without it, to the detriment of their development. Through failure to provide adequate drainage and sufficient filling, the forefeet may be so deep in the mud that young stock cannot reach over the rail to drink.

The water troughs should be inspected twice daily throughout the year in paddocks where the milkers are grazed, and once daily during the summer and twice a week in the winter in paddocks where other stock are run.

Pigs.

THE COST OF PRODUCING AND SELLING A PIG.

Whether pigs are profitable or not depends on their selling price and their production and selling costs. All these costs vary from time to time and from farm to farm, but the following notes will give pig raisers a basis on which they might calculate their pig production and selling costs.

It is not sufficient to be satisfied with a high price per head for porkers and baconers; it is the net return per pound which is really important. When pigs are sold "over the scales" or "on the hooks" the grower knows their weights. When sold at auction the pigs' live and dressed weights are usually estimated by the seller and buyer.

Pig production costs include food, labour, breeding stock and their food, interest on capital invested in plant, and depreciation on plant, i.e., housing, fencing, troughs, &c.

Selling costs may include freight to saleyards or to works, commission and yard dues, if sold at auction, and compensation fund tax. These costs are variable, but the following estimates are taken arbitrarily as fairly representative of pigs sold at auction. They are based on a 140-lb. dressed weight pig from the time of conception of its dam (i.e., including its share of keeping its dam) until it is sold at 200 lb. live weight when about 200 days old.

Food costs are the greatest part of the total costs and frequently the returns from pigs are stated in terms of return for food used. Leaving out food costs, the other costs per baconer are estimated as follow:—

	s.	*d.*
Labour	10	0
Interest on capital outlay ..	1	8
Depreciation on plant ..	1	0
Selling costs (at auction) ..	6	0
Total costs excluding food ..	18	8 or

1·6 pence per lb. on a 140-lb. carcass.

Under fair conditions it requires the equivalent of 7½ cwt. of meal to produce the 140-lb. baconer carcass. That 7½ cwt. may consist of

cereal meal with just sufficient protein and mineral supplement to balance the cereals, or separated milk may be used in large or small quantities with cereal meal. Pasture, forage crops, and other foodstuffs which are cheaper than cereal meals, may be used to replace a large part of the cereal meals, and so food costs vary according to the foodstuffs used.

Using cereal meals and just sufficient protein and mineral supplements to balance the diet, the 200-lb. liveweight pig would want 7½ cwt. total meals, of which 10 per cent or ¾ cwt. could be protein and lime and salt supplement costing 10s. delivered to the farm or its approximate protein equivalent in separated milk, 120 gallons at 1d. per gallon, 10s. This 10s. on a 140-lb. carcass is ·8d. per pound.

The remainder of the food requirements, 6¾ cwt. in terms of grain, are 12½ bushels of wheat or 15 bushels of barley.

When more separated milk is used than the 120 gallons necessary to balance the diet of grain, each additional gallon of separated milk is approximately equal to 1 lb. of grain.

Summarizing the above estimates, the costs of the dressed carcass are—

Total costs, excluding foods ..	.. 18s. 8d.—	1·6 per lb.
Protein + mineral supplement	.. 10s. 0d.—	·8d. per lb.
	£1 8s. 8d.—	2·4d. per lb.

If pigs are selling at auction at 6½d. per pound, estimated dressed weight, the 140-lb. pig makes—£3 15s. 10d.

Deduct costs—£1 8s. 8d.

£2 7s. 2d.

This latter amount is the return for 12½ bushels of wheat or 15 bushels of barley or their equivalent in other foods, that is, 3s. 9d. per bushel and 3s. 2d. per bushel respectively on the farm in usable form.

Pig raisers who have to purchase their grain or other foods must usually include freight and grinding costs, which would probably amount to 4d. per bushel in many cases; thus, on these figures, the net values for wheat and barley would be 3s. 5d. and 2s. 10d. per bushel respectively.

[L. A. Downey, H.D.A., Pig Expert.]

Sheep.

Shearing Preparations.

Preparations for shearing should be commenced so that everything will be in good working order before actual operations commence.

The sheds and counting-out pens should be thoroughly cleaned out, and any necessary repairs effected. All gates should be examined and hinges and fastenings put in good working order. As dragging gates and unsatisfactory fastenings are the cause of much unnecessary bother, they should be adjusted before shearing.

The wool press and other machinery require efficient servicing with a trial run well before the date shearing commences. Wool bales, stencils, ink, brushes, spare combs and cutters, and all other gear should be checked over to make sure that sufficient is on hand.

Handling the Wool.

The fleeces should be skirted and rolled correctly, and pressed and branded neatly. Full particulars of these operations appear in the Sheep Industry Bulletin, which is obtainable from the Director of Agriculture at a cost of 1s., post free.

Small owners are advised that, to obtain full values, the fleeces must be properly skirted and the skirtings, bellies, and all oddments of wool kept separate by using paper partitions within the bale or by putting them in sacks. It is not possible to re-skirt wool satisfactorily after it has been baled and pressed, and therefore badly-skirted wool is allotted a lower value.

Larger growers also are advised to pay more attention to the way they forward bellies, skirtings, and other oddments.

Classing of the 1940-41 Wool Clip.

The following report has been received from the controlling appraiser of the Victorian State Wool Committee:—

The classing of the 1940-41 wool clip, as offered in the Victorian markets, calls for comment upon several grounds, and, as it is the desire of all concerned to do everything possible to assist the Imperial Government, the following report and recommendations are made:—

The Imperial Wool Purchase Scheme was based upon the standard of classing in operation in 1938-39, and any departure from this

standard should be examined with a view to determining if the reasons for the change are justified.

The most noticeable feature of the 1940-41 appraisements has been the marked increase in the number of star lots in fleece lines, many of which were one or two bale lots, and this tendency is particularly noticeable in the larger Western District clips. This appears to have arisen from a natural desire on the part of classers to obtain a record price for one or two bales without due consideration to the effect upon the average price of the main fleece lines. It also seems to have arisen from the mistaken idea that the Table of Limits was designed to bring about a more minute classification of the clip, whereas the real purpose of the Table of Limits is to provide a basis for every class of wool produced in every section of the Commonwealth according to the recognized standards of classing in existence prior to the war.

Owners and classers may rest assured that the standard of classing which secured the best result in 1938-39 is the standard which will prove the most satisfactory under the Appraisement Scheme.

Classing of Station Clips.

While the classing of fleece lines in station clips has been overdone in some cases, sufficient attention has not been paid to the get-up of the skirtings. Growers may be faced with difficulty in securing sufficient and suitable labour, but there is no doubt that equally as much care and attention should be paid to the skirtings and oddments as was done previously. It is important to keep the brokens, pieces, and bellies regular in length and quality, and to remove short and fribby bits.

Classing of Smaller Growers' Clips.

In this section, great care should be taken to see that the skirting of the fleece is well done, and bellies removed, as this work cannot be carried out satisfactorily after the fleeces have been pressed. Where a small grower can class his fleece wool satisfactorily he should do so, otherwise he can have it attended to by his broker, or have it appraised as it stands.

He should pay as much care as possible to the get-up of his oddments, and these can be sent forward in a mixed bale with suitable divisions, preferably paper, or in sacks. If attention has been paid to the get-up of the fleece and oddments, the wool will be appraised to its full value under the scheme, but if it has been packed without care and is very mixed, it may be rejected and sent back for reclassing at the grower's expense prior to appraisement.

Doggy fleeces, rams' fleeces, and Downs types in particular, should be kept separate. It is desirable that all wool shorn from Downs sheep and lambs should be kept separate from other breeds, as they usually contain black hairs and would affect the value of other wools if mixed with them.

[N. A. Bowman, Sheep and Wool Expert.]

Veterinary Notes.

Arthritis or "Stiff Joints" in Lambs.

Arthritis is a fairly common disease at the present time, but it is not usually associated with high mortality. Frequently the affected lambs recover spontaneously after showing lameness for a week or two. The infection usually enters the body through the navel shortly after birth, or by way of wounds produced during marking and tailing operations At least two different micro-organisms are responsible, and these attack the joint tissues, producing inflammation, or arthritis.

No treatment can be suggested for the condition once it has developed, but antiseptic precautions should be taken at the marking and tailing operations. The lambs should be marked correctly, and all reasonable hygienic precautions taken. A pamphlet dealing with this subject has been published by the Department, and copies are obtainable free on application to the Director, Department of Agriculture, Melbourne.

Hypocalcaemia and Pregnancy Toxaemia.

Hypocalcaemia (milk fever) and pregnancy toxaemia ("twin lamb" disease or "lambing sickness") have been very prevalent this season. Leaflets dealing with these diseases also may be obtained free on application to this Department. Pending diagnosis of the causes of death, lambing ewes or ewes heavy in lamb showing symptoms of sickness should be given a cup of molasses in warm water daily. This will be beneficial if the trouble is due to hypocalcaemia, although it will not overcome pregnancy toxaemia. In either case this treatment is harmless.

Injections of *Calcium borogluconate* are even better. This drug can be obtained from any chemist, and should be on hand on every

property where sheep and cows are running, as it is very useful to prevent or overcome milk fever in both ewes or cows.

[W. D. Shiew, G.M.V.C., B.V.Sc., Senior Veterinary Officer.]

Poultry.

There is nothing that will cause failure on the poultry farm quicker than high mortality amongst the birds. If birds are to be kept healthy and vigorous strict attention to detail is necessary.

In the first place, care should be taken to breed only from stock possessing a high degree of constitutional vigour, as weak progeny produced from weak parents will not respond satisfactorily to good treatment. Birds of a good size, strong and healthy in appearance, free from coarseness, which have been bred from good healthy parents, possessing the ability to lay a large number of the best class of eggs, are the best stock to select for the breeding pen.

The houses should be rain-proof, the floor perfectly dry and covered with a good depth of clean straw litter, which should be cleaned out and replaced with clean straw at intervals of three months. Birds living under damp and cold conditions, and amongst contaminated straw, are likely to become diseased. All fittings must be kept clean. The perches should be movable and treated regularly with a good disinfectant for the prevention of red mite.

A constant watch should be kept on the birds, and any showing signs of sickness or weakness must be removed immediately to prevent the disease being transferred to the other birds. When new stock are purchased, it is wise to place them in isolated quarters, away from the other birds on the farm for at least two weeks, until it is seen that they are not ill.

Lastly, it should be realized that if good health of the birds and high egg production are to be maintained, a suitable variety of good, clean, and wholesome foods, including succulent green foods, is essential, and a continuous supply of clean drinking water, and shell grit should also be available.

[H. F. Clinton, Poultry Expert.].

Bees.

On warm days only and at the first favourable opportunity all colonies should be thoroughly examined and the conditions within each noted for future reference.

Unless the apiary is situated in a district where fresh honey is being gathered, the amount of food stored in each hive should be accurately estimated. Brood rearing will have commenced and consequently more honey will be required per day than during the past two months, when the colonies were semi-dormant and brood rearing at a standstill.

Where there is a shortage of honey the deficiency should be made up by feeding a syrup made by dissolving two parts of white sugar in one part of boiling water. The syrup should be used when luke-warm.

Feeding always should be done in the evening and inside the hive, otherwise robbing may be encouraged and weaker colonies exterminated by stronger ones. By using a tea or coffee pot, the syrup may be poured on to empty combs by laying the frame at a slight incline in a dish and gently pouring from a height of about 1 foot. After filling, the combs should be placed in a super and allowed to drain for a few minutes before placing in the hives next to the cluster of bees.

The entrances to all hives being fed should be reduced to a minimum as a further protection against robbing.

[J. W. Thomlinson, Apiary Inspector.]

Paspalum Ergotism in Cattle—*(Continued from page 442).*

as this fungus attacks only the flowering head. Where possible, however, the replacement of both *Paspalum* and couch grass with better pasture mixtures or on low river flats with such grasses as Kikuyu would be sound management.

The Fertilizers Act

Annual Review—Season 1940

By W. C. Robertson, Chemist.

THE Fertilizers Act (No. 3680) provides (*a*) power for duly authorized officers of the Department of Agriculture to inspect and withdraw samples from any parcel of artificial fertilizer (exceeding 56 lb. in weight) which is in stock at factory, or in transit to the consumer, or is in the possession of any vendor of, or dealer in, artificial fertilizers, and (*b*) for the purchaser of any fertilizer to have a sample withdrawn from the parcel purchased, providing the requisite notice of the intention to sample is served on the seller. The sample withdrawn in each case is for analysis and comparison with the guaranteed composition of the fertilizer.

In the first instance, the Department of Agriculture protects the grower; in the second, the grower is placed in the position of being able to protect himself.

Once the fertilizer is delivered to the farmer it ceases to be under any departmental control and it then becomes necessary for the farmer, should he entertain any suspicions regarding the quality of the fertilizer delivered, to take advantage of his powers under the Act. In the latter case, the Chemist of the Department is always ready to render assistance to the farmer, both in tendering essential advice and performing the actual work of sampling and analysis.

There is not any doubt that the majority of farmers are somewhat lackadaisical in their fertilizer purchases. This is probably due to the fact that more than 90 per cent. of the fertilizer used annually in the State consists of the simple fertilizer superphosphate, the manufacture of which is subjected to strict chemical control, so much so that the variation in quality is very slight and the quality practically is standardized on the guarantee, viz.:—

20·5 per cent. of Water Soluble Phosphoric Acid

·5 per cent. of Citrate Soluble Phosphoric Acid

1·0 per cent. of Citrate Insoluble Phosphoric Acid

22·0 per cent. of Total Phosphoric Acid

The same applies to the simple mineral fertilizers which supply the plant food nitrogen (sulphate of ammonia and nitrate of soda) and potash (potash sulphate and chloride or muriate). These fertilizers, however, even in normal times, are in comparatively small demand and at the present moment are either rationed or unavailable.

Owing to the fact that the quality of the above-mentioned fertilizers has regularly proved satisfactory, farmers are prone to regard all fertilizers in the same light and it is not unusual to find them spending large sums of money on fertilizer purchases without any care or inquiry as to quality guaranteed and price of the line delivered. To quote a case: A farmer recently ordered a parcel of blood and bone from a dealer. He was supplied with a "mixed" fertilizer of lower value than average quality blood and bone fertilizer and had actually used most of the parcel when it was pointed out to him that the labels attached to the bags and the brand on the bags showed the fertilizer to be a "mixed" fertilizer very different in composition to blood and bone. Although the farmer had noted when spreading the fertilizer that it appeared unlike the blood and bone usually purchased he was so indifferent that he did not bother to examine the guaranteeing label for the purpose of ascertaining just exactly what fertilizer had been supplied. To quote another instance: A number of mixed farmers in a northern district during the 1940 season purchased a quantity of seaweed manure. This manure was found to consist mainly of sea sand with small quantities of superphosphate and sea-weed intermixed. The price, £4 10s. per ton, was considerably more than double its commercial value, while the agricultural value for the purpose for which the stuff was sold would be little better than that of dry barnyard manure. When delivered no labels or brands appeared on the bags. In one case the farmer, from casual observation, was so disappointed with the material forwarded that he had not bothered to cart it from the rail to his farm, although the account had been paid. The fertilizer was not registered as required by the Act and sales ceased as soon as departmental inquiries were instituted.

The January issue of the *Journal* of the Departmental of Agriculture in each year contains the main list of fertilizers registered in Victoria for the year. The *Journal* usually is available at the local Mechanic's Institute or library, or may be obtained direct from the Department at a cost of 3d. post free. Should a reference to this list disclose that a new line of fertilizer, which is being offered for sale at a comparatively low price with exaggerated claims and odious comparisons, is not registered, then a letter should be forwarded immediately to the Chemist of the Department seeking information as to whether the fertilizer has been registered subsequent to the publication of the main list.

There is little necessity for the close examination by the farmer of parcels of the ordinary mineral fertilizers, but this does not mean that he need not examine the labels attached to the bags containing the fertilizer purchased. He also should demand the invoice certificate or warranty which should be forwarded to the purchaser at the time of sale or before delivery. Without this invoice certificate or warranty he is powerless in case of a dispute.

Further, it is essential that the retail price charged per ton should be carefully checked. Instances have come under notice where the account rendered to the farmer for the purchase of fertilizer does not show the tonnage or the price charged, but simply states something like this—"254 bags of fertilizer, £140". On the other hand, in the case of certain lines of "mixed" fertilizers (which must not be confused with complete fertilizers, i.e., those containing appreciable percentages of the three principal plant foods—nitrogen, phosphoric acid and potash) and fertilizers of organic origin, such as bonedust, blood and bone, animal fertilizer and the like, the purchaser is well advised who considers the purchase very carefully both before deciding to order and on receipt of the material.

It is strange, but nevertheless true, that certain brands of blood and bone are being retailed by dealers at the same price per ton irrespective of the registered price (which is not fixed by the Prices Commissioner) or the guaranteed quality. This matter is now receiving the Department's attention. In the meantime users can assist by carefully checking figures and demanding the brands showing the best value.

The various activities of this Department have largely reduced the ill effects of the trade propaganda used by the salesmen associated with secondary lines (mainly by-products) which are based on a small capital outlay, limited output and quick turnover, and the exaggerated and often ridiculous claims necessary to influence the farmer sufficiently to "get the business".

However, although instances of illegal selling and exploitation are forever occurring, the correct presentation of the values of a fertilizer will always be the best method of increasing its use or stabilizing the business, and those who depart from this practice must fail in the long run.

During the 1940 season some two dozen samples of various fertilizers were withdrawn from parcels at store and factory. One sample was submitted by the manufacturer under section 28 of the Act at the request of the Hon. the Minister of Agriculture for the sole purpose of comparison with the quality as supplied to the user. The majority of the samples (15) consisted of samples of blood and bone and animal or organic fertilizers. It was found that one brand of animal fertilizer contained hydrolized or treated leather, which cannot by any stretch of imagination be deemed equal to animal fertilizer in the truest sense of the term.

The results of the analyses of the samples collected during the year, together with the figures representing the guaranteed quality, are to be found at the conclusion of this article.

One prosecution was brought to a successful conclusion when a small manufacturer was fined for selling an unregistered fertilizer, while other activities resulted in a definite improvement in the quality of some brands.

Reference has been made to "mixed" fertilizer. For many years this term has been generally applied to mixtures of two fertilizers, as for example, bone and super., super. and ammonia, and more recently ammonia and phosphate and super. and potash. Recently, however, the term is being applied to mixtures of certain by-products of more or less unknown or doubtful value, reinforced with well-known active fertilizers of proved value. In this case, the farmer may be paying a high price for a low-grade filler. In future, it is proposed to disclose the raw materials from which these mixtures are prepared so that the farmer will know exactly what he is buying.

RESULTS OF THE ANALYSES OF SAMPLES OF FERTILIZERS COLLECTED IN VICTORIA DURING THE 1940 SEASON UNDER THE PROVISIONS OF THE FERTILIZERS ACT 1928 (No. 3680).

Bottle Label Number.	District in which the Sample was Obtained.	Brand and Description of the Fertilizer.	Analysis as Guaranteed by the Manufacturer or Found by the Chemist.	Nitrogen.			Phosphoric Acid.				Potash as Sulphate.	Manufacturer or Importer.
				As Ammonia.	As Blood and Bone.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.		
				%	%	%	%	%	%	%	%	
1964	Merbein ..	Pennells Mixed Manure	Guaranteed	..	5·50*	5·50	1·00	3·50	7·50	12·00	..	G. W. Pennell, Burke-street, Braybrook
			Found ..	..	5·38	5·38	1·91	3·40	7·35	12·66	..	
2002	Red Cliffs	Pannifex's No. 14 Animal Fertilizer	Guaranteed	..	5·00	5·00	..	6·00	8·00	14·00	..	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-street, Melbourne
			Found ..	..	5·67	5·67	..	4·97	10·15	15·12	..	
2003	Echuca ..	Echuca No. 1 Blood and Bone Fertilizer	Guaranteed	Not registered								B. A. Thomas, Echuca
			Found ..	..	4·82	4·82	..	4·55	11·56	16·11	..	
2004	Bendigo ..	Bendigonian (in oval) Animal Fertilizer	Guaranteed	..	4·50	4·50	..	5·00	10·50	15·50	..	Bendigo Fertilizer and Wool Co. Pty. Ltd., View Point, Bendigo
			Found ..	..	4·57	4·57	..	4·66	13·24	17·90	..	
2006	Irymple ..	Sickle—in diamond —Sulphate of Ammonia	Guaranteed	20·60	..	20·60	..	..	..	..	..	Commonwealth Fertilizers and Chemicals Ltd., 65 William-street, Melbourne
			Found ..	21·07	..	21·07	..	..	..	..	..	
2007	Mildura ..	Pivot Superphosphate	Guaranteed	..	..	..	20·50	0·50	1·00	22·00	..	Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-street, Melbourne
			Found ..	..	..	..	20·58	0·50	1·40	22·48	..	
2008	Oakleigh ..	Fitzgeralds Blood and Bone	Guaranteed	..	5·00	5·00	..	5·25	9·75	15·00	..	P. Fitzgerald and Sons, Oakleigh
			Found ..	..	5·60	5·60	..	5·96	10·87	16·83	..	
2009	„ ..	Fitzgeralds Animal Fertilizer	Guaranteed	..	3·75	3·75	..	5·75	13·25	19·00	..	„ „ „
			Found ..	..	4·06	4·06	..	6·53	17·60	24·13	..	
2010	Shepparton	Valley Blood and Bone	Guaranteed	..	5·09	5·09	..	3·44	4·23	7·67	..	Goulburn Valley Freezing Works, Shepparton
			Found ..	..	5·96	5·96	..	3·55	3·78	7·33	..	
2014	Bendigo ..	Bendigonian (in oval) Blood and Bone	Guaranteed	..	4·50	4·50	..	5·00	10·50	15·50	..	Bendigo Fertilizer and Wool Co. Pty. Ltd., View-street, Bendigo
			Found ..	..	4·46	4·46	..	5·22	14·46	19·68	..	
2015†	Victoria Market, North Melbourne	Sidney Lyall's Animal Fertilizer (Blood and Bone)	Guaranteed	..	5·00	5·00	..	6·00	8·00	14·00	..	Sidney Lyall, Victoria Market, North Melbourne
			Found ..	..	5·11	5·11	..	4·44	11·29	15·73	..	
2017	Merbein ..	Cresco Superphosphate and Ammonia (6 + 1)	Guaranteed	2·85	..	2·85	17·48	0·42	0·85	18·75	..	Cresco Fertilizers Ltd., Geelong
			Found ..	2·93	..	2·93	17·85	0·65	1·60	20·10	..	
2020	Mildura ..	Sickle in diamond Superphosphate and Ammonia (3 + 1)	Guaranteed	5·00	..	5·00	15·40	0·30	0·80	16·50	..	Commonwealth Fertilizers and Chemicals Ltd., 65 William-street, Melbourne
			Found ..	5·33	..	5·33	16·00	0·38	0·73	17·11	..	
2022	Ballarat ..	Arch No. 1 Blood and Bone	Guaranteed	..	7·00	7·00	..	4·50	3·50	8·00	..	Amalgamated Freezing Co. (Vic.) Pty. Ltd., 54 Market-street, Melbourne
			Found ..	..	7·02	7·02	..	4·55	5·57	10·12	..	
2026	Sale ..	Newnhams Bone Fertilizer	Guaranteed	..	2·28 (as bone)	2·28	..	6·86	16·72	23·58	..	Newnham Pty. Ltd., Box 8, Post Office, Sale
			Found ..	..	2·00	2·00	..	6·44	19·30	25·74	..	
2028	Red Cliffs	P.B. Blood and Bone	Guaranteed	..	5·60	5·60	..	8·00‡	4·00‡	12·00	..	Clarence McDougall, 373–375 Little Bourke street, Melbourne
			Found ..	..	5·29	5·29	..	4·31	8·07	12·38	..	
2029	,,	Cresco Mixed Manure No. 1	Guaranteed	1·00	1·40	2·40	11·25	2·00	4·50	17·75	5·00	Cresco Fertilizers Ltd., Geelong
			Found ..	1·27	1·37	2·64	11·20	2·17	4·47	17·84	5·11	
2030	..	Sun Brand Sulphate of Potash	Guaranteed	..	..	..	..	..	..	..	48·00	Mildura Co-operative Fruit Packing Co. Ltd., Mildura
			Found ..	..	..	..	..	..	..	..	48·61	
2031	,,	Cresco 22 per cent. Superphosphate	Guaranteed	..	..	..	20·50	0·50	1·00	22·00	..	Cresco Fertilizers Ltd., Geelong
			Found ..	..	..	..	20·00	0·62	1·60	22·22	..	
2033	..	Sickle in diamond Market Garden Manure	Guaranteed	1·70	1·50	3·20	11·50	2·50	3·10	17·10	2·42	Commonwealth Fertilizers and Chemicals Ltd., 65 William-street, Melbourne
			Found ..	1·95	1·61	3·56	12·24	2·32	2·64	17·20	2·68	
6705	Merbein ..	M.S.C. Blood and Bone (Animal Fertilizer)	Guaranteed	..	5·50	5·50	..	4·50	6·00	10·50	..	Mildura Shire Council, Mildura
			Found ..	..	6·25	6·25	..	4·70	6·37	11·07	..	
6707	Mildura ..	„ „ „	Guaranteed	..	5·50	5·50	..	4·50	6·00	10·50	..	„ „ „
			Found ..	..	7·90	7·90	..	3·64	4·08	7·72	..	
6709	,, ..	§Pannifex's No. 2 Bonedust	Guaranteed	..	..	3·50 (as bone)	..	..	..	19·00	..	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-street, Melbourne
			Found ..	..	..	3·85	..	..	..	24·52	..	
6714	Red Cliffs	‖Nuelife Bonedust..	Guaranteed	..	..	3·50	..	..	..	22·00	..	E. F. Peters and Sons Pty. Ltd., Dunolly
			Found ..	..	..	4·23	..	..	..	22·94	..	
..	Sample forwarded under section 28 of the Act	P.B. Blood and Bone	Guaranteed	..	5·60	5·60	..	8·00	4·00	12·00	..	Clarence McDougall, 373–375 Little Bourke-street, Melbourne
			Found ..	..	5·96	5·96	0·45	3·42	7·73	11·60	..	

* As bone, meat, and skin. † This sample was found to contain hydrolized leather. ‡ These figures should be reversed, apparently a mistake was made in labelling, see sample results at the end of this list. § Fine bone guaranteed 50 per cent., found 76·59 per cent. ‖ Fine bone guaranteed 50 per cent., found 60·33 per cent.

In the Garden

By A. W. JESSEP, M.Agr.Sc., B.Sc., Dip. Ed.,
Principal, School of Horticulture, Burnley

SEPTEMBER is a very busy month in the garden. As soon as the flowering apricots, peaches, and plums have finished flowering, they should be cut back. This allows the plant to send out strong new growth on which next year's flowers will be produced. If not pruned back, the flowers will be on small outgrowths which are not so suitable for indoor decoration.

Spring Treatment of Lawns.

The established lawns require special attention in the early spring. If the lawn has small bare patches, it would be advisable to prick up these areas, sow a little appropriate seed and lightly cover it with some fine soil. The manurial treatment of an average fine-grass lawn is to top-dress it in September with sulphate of ammonia at the rate of about 1 oz. and not more than 2 oz. per square yard. Spread the fertilizer as evenly as possible, and unless it rains give the lawn a light watering to wash it in. In the autumn top dress with equal parts of superphosphate and sulphate of ammonia at the rate of 1½ to 2 oz. per square yard.

The fine-grass lawns are usually planted either in the spring or autumn, and in both cases the area should be thoroughly prepared so as to destroy as many weed seeds and weeds as possible. An attractive fine lawn may be obtained by sowing 1 part of New Zealand Dryland Brown Top with 2 parts of Chewing's Fescue at the rate of 1 oz. per square yard. This type of lawn requires careful attention, but if a hardier type is desired, use 2 parts of Kentucky Blue, 2 parts Chewing's Fescue, and 1 part Brown Top at the same rate of sowing as above. Before sowing the seed, divide it into two equal parts, sowing one lot over the whole area and the other half over the same area, but at right angles to the first sowing. This ensures a more even distribution than if the seed is all sown the one way. After sowing, scatter over the area sufficient light soil to just cover the seed or, if soil is not available, carefully rake in the seed. Do not cut the lawn until the grass is 3 to 4 inches high and use a sharp mower so as not to unduly disturb the young plants. These fine grasses are not very satisfactory for the drier and hotter areas, and under such conditions couch, buffalo, or kikuyu grass may be grown. They do not make such an attractive lawn, but stand up to the adverse summer conditions much better.

Vegetables.

Although the weather is still wet and cold, arrangements should be made for the spring sowings. For frost-tender vegetables, to mature early, grow the young seedlings on in pots under cover and transplant them into their permanent positions after the danger of frosts has passed.

Tomato, cucumber, marrow, &c., may be grown in this way and transplanted about October. Make a small sowing of butter or French beans this month, but in southern Victoria do not sow a main crop until October.

The cucumber is popular for salads and similar dishes. It is very frost-tender, but is easily grown throughout the summer. It will grow in almost any garden soil but prefers a light one with a good supply of organic material and plenty of water during the growing period. Plant three to four seeds in groups 1 inch deep and 4 feet between each group. When the plants are well established, mulch with straw manure and water freely. If early cucumbers are required, plant the seed in early September and grow them on in pots under cover ready to be transplanted into their permanent position in October. They take about 60–80 days from the time of sowing the seed until they are ready for picking, and cucumbers may be obtained from the same planting for about three to four weeks. To have a succession of cucumbers, it is necessary to make monthly plantings from October until about January–February. If the plants are growing freely and not setting many cucumbers, cut off the tips of the runners. This checks the plant and encourages the setting of the cucumber. The vegetable should be picked when nearly full grown and before the outer skin begins to turn yellow. A prime cucumber should be brittle and snap in halves easily.

White Spine is the most popular variety. It is green and cylindrical with small white spines.

Long Green Prickly is the variety usually grown in the greenhouse. It is up to 24 inches long and 3 inches in diameter.

Apple Shaped, Round Early, White Crystal Apple are three very good varieties for the home garden. They are about 4 inches to 6 inches in diameter, oval, with almost white skins which change to yellow as they mature. They should be used before they change colour. These round apple types are more easily digested than the others and of a good flavour. They are especially recommended for growing in the home garden.

In the Orchard

By G. W. Gayford, B.Agr.Sc., Assistant Horticultural Research Officer

ALTHOUGH spring is a season of beauty in the orchard districts fruit growers in general have not much time to appreciate its beauty because of the many important jobs requiring attention at this time of the year.

As it is desirable to complete the manuring and cultivating of fruit trees before blossoming, stone fruits by now should have received this treatment. There is still time to complete the ploughing of apple and pear orchards before bud burst. Artificial fertilizers, of which the most useful form available at the present time is "complete" (4 : 4 : 1) fertilizer, should be applied at the rate of 5 lb. per tree before ploughing or deposited in furrows near the perimeter of the tree.

Because of the shortage of sulphate of ammonia, citrus growers, and others who favour this fertilizer, will have to make use of other forms of nitrogen. Blood manure (12 per cent. nitrogen) or castor meal (5 per cent. nitrogen) may be used. Proportionately heavier dressings of these lower grade manures are required to make the actual amount of nitrogen applied equal to a normal dressing of sulphate of ammonia; i.e. if a dressing of sulphate of ammonia is usually given at the rate of 5 lb. per tree, approximately 10 lb. per tree of blood manure or 20 lb. per tree of castor meal would be required.

When obtainable, full use of animal manures should be made. Poultry manure is one of the richest animal sources of plant nutrients and should be used at the rate of half a bag to the tree. It should be remembered that these organic manures release nitrogen more slowly than sulphate of ammonia or nitrate of soda. Early application, therefore, is desirable so that some nitrogen will be available to the trees at blossoming.

Another task which will be engaging the mind of many apple growers this month will be the reworking of old and unwanted varieties, chiefly of apples and pears. The attention of such growers is directed to the articles on budding, grafting and reworking of fruit trees in this *Journal* for July and August and the present month.

The following varieties are considered suitable as scions when reworking less profitable varieties:—

Apples:—Jonathan, Granny Smith, Rome Beauty, Red Rome, Delicious, Gravenstein, Democrat, Statesman, Crofton and Cleopatra.

Pears:—Josephine, Packham's Triumph, Winter Cole, Winter Nelis and W.B.C.

During the month, spraying of apple and pear trees for black spot control will commence. Growers should realize the necessity for thoroughness in the pre-blossom sprays, because, if control is achieved at this time of the year, no trouble will occur with summer spot later on in the season. Apples should be sprayed with Bordeaux mixture 6 : 4 : 40 when the tips of the young leaves are just protruding from the newly opened buds. A spray of lime sulphur, 2¼—80 is given when only 5 to 10 per cent. of the blossoms have opened.

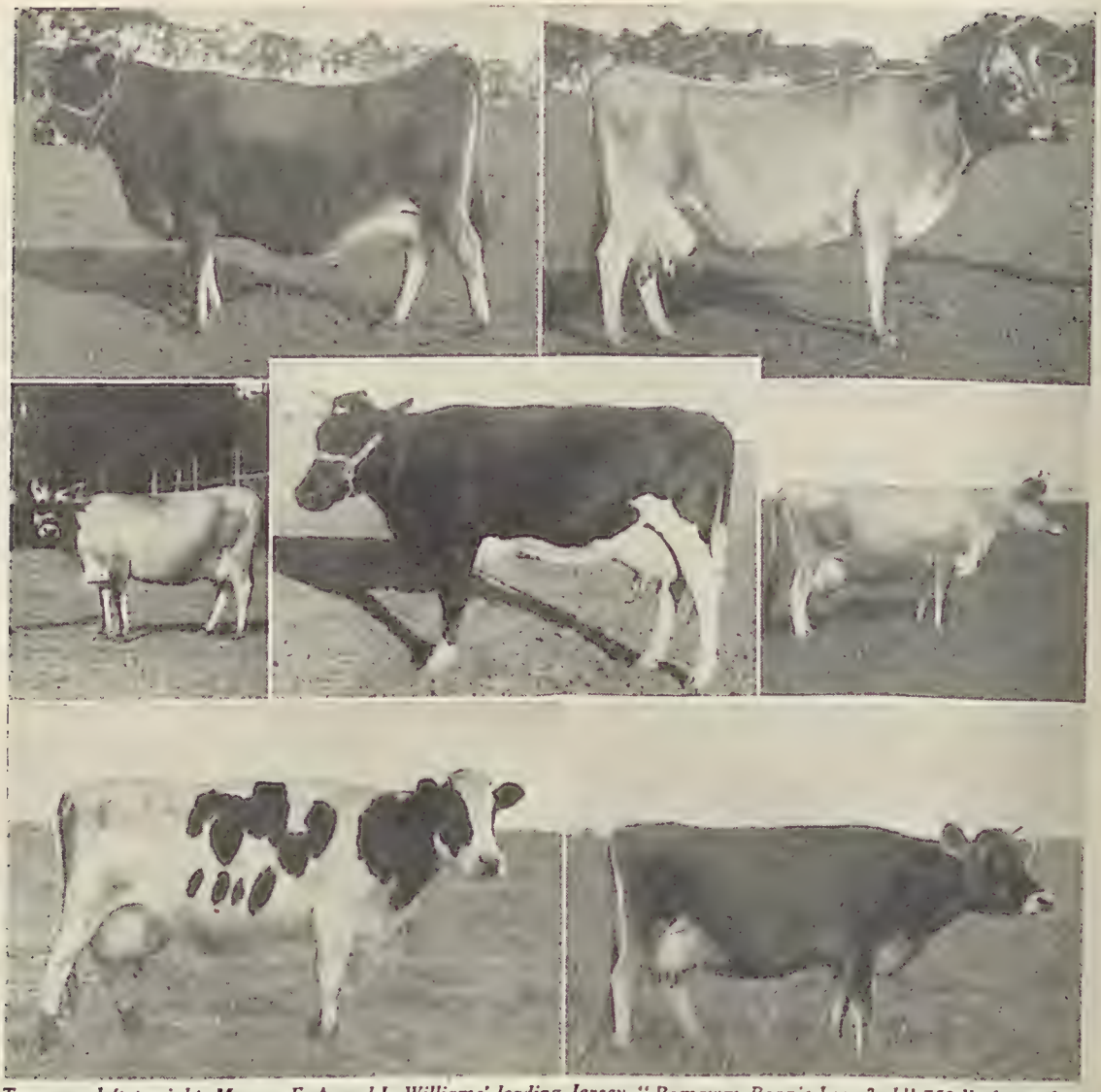
Pears should receive a Bordeaux mixture spray 6 : 4 : 40 at the "green tip" stage and again at the "finger" stage. This latter stage is recognized when the leaves have separated from the blossom buds which are commencing to separate in the cluster. The Josephine and Winter Cole varieties should receive only one spray at an early "green tip" stage.

If red spider is noticeable on either apple or pear trees, a gallon of red or pale oil should be added to the Bordeaux spray applied at the "green tip" stage.

For the control of brown rot on cherries, early ploughing is necessary in order that any infected twigs or mummified fruit will be buried before blossoming. In addition, a spray of Bordeaux mixture 6 : 4 : 40 should be applied at the "green tip" stage followed by lime sulphur, strength 1–80, when the fruit is quarter grown.

In citrus groves where Septoria or Anthracnose would appear troublesome, spray immediately with a 3 : 3 : 50 Bordeaux spray combined with half a gallon of white oil emulsion. If "mottle leaf" is visible on citrus trees, apply a zinc-lime spray made by adding 10 lb. of zinc. sulphate and 5 lb. of slaked slime to one hundred gallons of water, after harvesting of the crop is completed.

Considerable quantities of oranges depreciated in value this year because of rind blemishes. The damage is caused principally by wind and obviously points to the need for provision of adequate shelter strips. Suitable trees for this purpose are sugar gums interplanted with either pepper trees (*Schinus molle*) or lucerne trees (*Cytisus proliferus*).



Top row, left to right, Messrs. F. A. and L. Williams' leading Jersey, "Bamawm Bonnie Lass 2nd," 750 lb. butterfat and "Bamawm Primrose," 672 lb. butterfat. Centre row, Messrs. R. G. Gay and Son's mature, "Elm Grove Silvermine," 636 lb. butterfat; Mr. R. W. Smith's mature Friesian, "Wattlebank Violet," 628 lb. butterfat; Mr. R. H. Mitchell's "Clifford Park Gladsome," 602 lb. butterfat. Lower row, "Warwick Lizzie Oakwood" (C. S. Walker, Swan Hill), 617 lb. butterfat, Messrs. S. A. Masters and Son's mature, "Rutland Brunette 16th," 624 lb. butterfat.

four-year-old, with 738 lb. "Yarraview Iris," a herdmate, is fifth in this class, with a 543 yield.

A 560-lb. effort places "Yarraview Beryl" in the Senior three-year-old section, while "Yarraview Teeney" is among the "Senior fours," with a 534-lb. yield. "Yarraview Benefactoress," last year's Junior two-year-old leading this stud, has been a remarkably persistent producer, for she has followed her Junior-two yield of 521 lb. with a Senior-two record of 632 lb. butterfat.

As usual, there are several "Madeira's" and "Starbrights" in the lists to represent the champion herd of Mr. R. M. Chirnside. The record of 677 lb. brings "Mornmoot Fancy Starbright" into third place among the mature cows, while "Mornmoot Princess Madeira 9th" and "Mornmoot Fancy Madeira 6th" are among the leading Junior four-year-olds. "Mornmoot Fancy Starbright 3rd" and "Mornmoot Fancy Starbright 4th" appear among the "Junior Threes" and the Senior-two respectively.

"Mornmoot Mimi" represents another family. She is a 610-lb. Junior three-year-old, whose dam, "Werribee Mimi," twice exceeded the 600-lb. level in her day.

A young breeder of Friesians, Mr. M. T. Hore, holds pride of place in the Senior four-year-old section, his cow, "Elmar Lassie," yielding 570 lb. butterfat. Mr. R. W. Smith's "Wattle Bank Fairy 2nd," with 532 lb., is another Friesian to gain a place in this class.

The leading Junior three-year-old, "Karrara Fancy Maderia," is a daughter of "Werribee Fancy Maderia," Champion Herd Test cow in 1934. Her excellent yield of 652 lb. indicates the ability of this great family to produce well in other hands as well as at Mornmoot.

It would be strange indeed to read a Standard Herd Test report without a "Tooravale Princess" in it. On this occasion, "Toora-

THE SIX LEADING COWS IN EACH SECTION.

Owner.	Name of Cow.	Class.	Breed.	Butter-fat.
R. W. Smith	Road's End Sandra	Mature	Friesian	811
F. A. and L. Williams	Bamawm Bonnie Lass 2nd	"	Jersey	750
R. M. Chirnside	Mornmoot Fancy Starbright	"	Jersey	677
F. A. and L. Williams	Bamawm Primrose	"	"	672
J. H. Goddard	Inverurie Maggie	"	Ayrshire	672
Salesian College	Glenloth View De Kol	"	Friesian	664
M. T. Hore	Elmar Lassie	Senior 4	Friesian	570
J. Handbury and Son	Tooravale Bettwys-y-Coed	"	Jersey	563
C. S. Grice	Banyule Silvermine 99th	"	"	549
G. A. McNabb and Son	Maxon Bright Primrose 2nd	"	"	548
A. E. T. Payne	Yarraview Teeney	"	Guernsey	534
R. W. Smith	Wattle Bank Fairy 2nd	"	Friesian	532
A. E. T. Payne	Yarraview Le Mode	Junior 4	Guernsey	738
R. M. Chirnside	Mornmoot Princess Madeira 9th	"	Jersey	661
Mrs. H. A. Prince	Surrey Bonnie Girl 4th	"	"	549
R. M. Chirnside	Mornmoot Fancy Madeira 6th	"	"	544
A. E. T. Payne	Yarraview Iris	"	Guernsey	543
Ballarat Orphanage	Orphanage Melba 11th	"	Jersey	536
J. H. Goddard	Inverurie Blue Belle	Senior 3	Ayrshire	770
Ballarat Orphanage	Orphanage Mirthmaker 9th	"	Jersey	635
P. J. Maloney	Belgonia Junette 5th	"	"	630
R. M. Chirnside	Mornmoot Mimi	"	"	610
A. E. T. Payne	Yarraview Beryl	"	Guernsey	560
Nancarrow Bros.	Pine Ridge Lady	"	Jersey	534
Devon Park Stud	Karrara Fancy Madeira	Junior 3	Jersey	652
J. H. Goddard	Inverurie Hester	"	Ayrshire	592
J. Handbury and Son	Tooravale Princess 28th	"	Jersey	587
Estate of late J. D. Read	Springhurst Ronald's Duchess	"	"	549
Dr. A. R. Haywood	Windrest Chevy's Dainty	"	"	533
R. M. Chirnside	Mornmoot Fancy Starbright 3rd	"	"	530
A. E. T. Payne	Yarraview Benefactoress	Senior 2	Guernsey	632
R. M. Chirnside	Mornmoot Fancy Starbright 4th	"	Jersey	547
G. Tandberg and Son	Veresdale Bushbee	"	A.I.S.	532
P. W. Clark	Tooronga Aldan's Wyandotte	"	Jersey	500
Mrs. H. A. Prince	Pine Ridge Dreamgirl 2nd	"	"	499
Dr. A. R. Haywood	Windrest Twinkle's Beautiful	"	"	491
T. M. Noble and Son	Finchley Bluebell's Duchess	Junior 2	Jersey	535
Estate of late J. D. Read	Springhurst Soeurette's Narcissus	"	"	500
J. H. Goddard	Inverurie Belle	"	Ayrshire	484
R. H. Bennett	Edenhope Rosetta	"	Jersey	482
Dr. A. R. Haywood	Windrest Chevy's Delight	"	"	473
J. W. Bennett	Ellendale Kirsty 38th	"	"	468

Mr. E. J. Vagg's mature Jersey, "Rydon May Queen 2nd," yielded 628 butterfat.

vale Princess 28th," with 587 lb., is third among the Junior three-year-olds, while a herd mate, "Tooravale Bettwys-y-Coed," is second in the Senior four-year-old class.

The Springhurst herd is represented in the 549-lb. Junior three-year-old "Springhurst Ronalds Duchess," and "Springhurst Sourettes Narcissus," a 500-lb. Junior two-year-old.

The successfully proven sire, "Duke of the Lake Imp., is represented by three daughters in two herds. "Pine Ridge Lady" followed up her 427 Junior-two and 501 Senior-two records with a Senior three-year-old effort of 534 lb. butterfat; while Mrs. H. A. Prince's "Pine Ridge Dream Girl 2nd" produced 499 lb. as a Senior two-year-old. "Molly 4th" produced 464 lb. as a Junior two-year-old. "Surrey Bonnie Girl 4th"—third in the Junior four-year-olds—is yet another entry from Mrs. Prince's select herd, which has recently transferred from the Swan Hill Herd Test Association.

Dr. A. R. Haywood, who was a member of an Association, is another to gain prominence in this year's lists. His "Windrest Chevys Dainty," with 533-lb. butterfat as a Junior three-year-old, and "Windrest Chevy's Delight" (473 lb. butterfat) as a Junior-two, brings to mind that remarkable old test cow, "Melrose Chevy 13th," whose unusual udder development was so reminiscent of her sire's dam—"Boutillere," of Jersey Island. "Windrest Twinkle's Beautiful" is sixth among the Senior two-year-olds with a yield of 491 lb. butterfat.

There are other fine performances among the leaders of this report, as well as many good performers, even further down the lists than the first hundred.

Conclusion.

Of the 2,078 cows appearing in this report, no fewer than 132 exceeded the 500-lb. level of butterfat.

The following table gives some indication as to how they occur in regard to age and yields:—

Class.	Over 800.	700–800.	600–700.	500–600.	Total.
Matures ..	1	1	15	68	85
Senior 4 ..	..	..	..	11	11
Junior 4 ..	..	1	1	11	13
Senior 3 ..	..	1	3	7	11
Junior 3 ..	..	..	..	6	6
Senior 2 ..	..	..	1	3	4
Junior 2 ..	..	..	1	1	2
Total ..	1	3	21	107	132*

* Grand Total.

The Standard Herd Records for the quarter ended 30th June, 1941, which are usually published in the September *Journal*, have been omitted this year on account of the shortage of paper due to the war.

These records, however, will be included in the Standard Herd Test pamphlet to be published toward the end of September. Copies of this pamphlet may be obtained post free after 1st October from the Superintendent of Dairying, Department of Agriculture, Melbourne, C.2.

Several members of Mr. J. H. Goddard's "Cora Lynn" leading Ayrshire herd (10 to 14 cows class). This herd averaged 533·5 lb. butterfat.

HERD AVERAGES, 1940-41.

Owner.	Breed.	Junior 2-year-old.		Senior 2-year-old.		Junior 3-year-old.		Senior 3-year-old.		Junior 4-year-old.		Senior 4-year-old.		Mature.		Total Herd.	Average without Allowances.	Average with Allowances.
		No.	Average.	No.	Average.	No.	Average.	No.	Average.	No.	Average.	No.	Average.	No.	Average.	No.	lb.	lb.
			lb.		lb.		lb.		lb.		lb.		lb.		lb.			
HERDS OF 25 COWS AND OVER.																		
1. Payne, A. E. T.	Guernsey	6	338·3	1	632·5	5	452·5	1	559·9	5	510·1	3	458·6	6	508·4	27	461·5	524·6
2. Maloney, P. J. ..	Jersey ..	13	375·5	2	367·1	1	460·4	3	490·5	1	533·5	..	..	5	509·9	25	425·2	512·6
3. Noble, T. M. and Sons	,, ..	10	391·3	1	420·6	5	454·0	2	497·5	2	486·6	..	..	11	461·2	31	440·2	509·5
4. Bennett, J. W.	,, ..	14	390·9	3	445·3	1	420·9	1	473·1	2	370·5	..	..	9	440·3	30	413·5	494·4
5. Waterhouse, H. W. and Son	,, ..	10	338·8	1	323·9	4	424·4	2	477·8	3	471·4	2	476·9	5	453·1	27	407·3	483·7
6. Read, Estate of late J. D.	,, ..	10	306·9	4	322·6	4	435·8	2	419·9	2	475·7	..	..	7	472·3	29	386·2	466·3
7. Devon Park Stud (Daley, G. S.)	,, ..	5	320·6	4	376·5	7	440·3	..	..	4	372·9	..	..	10	432·3	30	440·2	465·0
8. Ballarat Orphanage	,, ..	4	330·6	1	481·6	2	407·5	3	483·7	3	470·6	2	435·9	22	412·8	37	417·1	457·3
9. McNabb, G. A. and Son	,, ..	13	301·2	5	366·0	5	403·7	5	385·7	2	383·8	6	447·4	25	401·2	61	379·9	451·4
10. Hore, E. ..	,, ..	12	291·1	5	354·4	5	383·9	6	404·1	1	437·4	..	..	9	431·3	38	366·5	450·1
11. Walker, C. S. ..	,, ..	6	301·8	1	370·4	5	381·7	3	441·2	2	342·9	1	466·3	7	432·0	25	383·8	448·8
12. Atkinson, W. K.	Dairy Shorthorn	11	297·0	..	..	11	328·5	5	388·5	3	387·4	4	366·4	30	403·0	64	367·8	434·5
13. Bennett, R. H.	Jersey ..	12	298·6	..	..	3	362·5	3	382·5	..	..	1	393·8	7	429·6	26	354·6	432·4
14. Department of Agriculture	Red Poll	17	282·6	1	264·0	5	323·4	8	345·0	1	359·2	6	360·6	15	389·5	53	336·0	415·0
15. Smith Bros. ..	Jersey ..	6	282·7	4	276·0	5	272·2	3	334·1	1	384·8	6	349·8	18	360·0	43	328·5	385·8
16. Lyon, W. H. ..	,, ..	9	239·4	1	255·6	3	331·1	2	359·0	..	..	2	349·1	8	326·6	25	297·3	365·5
HERDS OF 15 TO 24 COWS.																		
1. Chirnside, R. M.	Jersey ..	6	391·2	3	466·5	2	484·7	1	610·3	2	602·5	..	..	7	554·8	21	495·1	561·8
2. Williams, F. A. and L.	,, ..	3	379·3	1	405·4	..	..	1	477·0	..	..	1	390·7	9	573·5	15	504·8	540·8
3. Enders, N. H. ..	,, ..	6	372·0	2	446·1	2	448·1	1	518·6	..	..	..	..	4	478·8	15	430·3	506·3
4. Handbury, J. E. and Son	,, ..	5	340·4	2	359·7	3	442·0	1	499·9	1	400·7	1	563·1	2	484·8	15	412·1	489·4
5. Smith, R. W. ..	Friesians	4	310·6	3	398·8	..	..	1	328·5	1	427·4	1	532·2	7	523·9	17	435·0	488·9
6. Haywood, Dr. A. R.	Jersey ..	6	401·0	2	422·9	8	384·9	1	408·0	2	276·0	2	432·2	3	527·7	24	406·5	483·5
7. Clarke, F. W. ..	,, ..	9	327·9	..	..	2	407·4	1	406·9	2	463·9	1	500·9	4	494·4	19	398·9	474·6
8. Vaughan Bros. ..	,, ..	6	339·6	2	457·7	2	411·5	..	..	2	403·2	..	..	6	460·4	18	408·0	474·0
9. Austin, F. ..	,, ..	5	337·1	1	444·6	4	355·6	2	487·4	1	344·8	2	453·7	7	459·6	22	408·9	467·9
10. Clark, P. W. ..	,, ..	10	354·9	3	389·2	..	..	1	335·2	..	..	4	430·3	5	450·1	23	392·3	467·6
11. Banyule Stud Pty. Ltd.	,, ..	13	301·1	1	266·5	4	425·1	1	463·8	1	358·8	..	..	3	457·3	23	351·1	445·5
12. Fairchild and Clutterbuck	,, ..	6	326·4	2	380·6	5	374·6	1	343·2	..	..	1	329·7	2	402·0	17	357·0	440·4
13. Broad, Mrs. A. A.	,, ..	6	299·0	1	365·9	5	352·8	1	368·6	2	401·1	..	..	1	429·2	16	345·2	430·7
14. Nicholas, M. A.	,, ..	5	351·6	5	350·0	1	390·4	1	299·2	4	357·2	..	..	5	389·3	21	360·6	430·3
15. Colenso, L. W. R.	,, ..	3	239·3	3	322·0	4	355·1	1	446·5	1	346·9	1	437·1	8	416·0	21	364·9	420·3
16. Meaklin Bros. ..	Dairy Shorthorn	4	301·3	2	338·2	2	322·6	..	..	1	446·9	..	..	9	401·1	18	365·7	416·1
17. Hore, M. T. ..	Friesian..	7	281·0	1	277·3	..	..	1	343·7	1	317·7	2	434·3	5	439·6	17	351·3	415·8
18. Tomasetti, B. G.	Ayrshire	12	268·3	1	283·7	3	351·5	..	..	3	437·9	..	..	3	388·2	22	319·8	409·7
19. Vagg, E. J. ..	Jersey ..	9	297·7	..	..	4	313·4	4	309·4	1	311·5	..	..	2	479·1	20	322·0	408·5
20. Department of Agriculture	Friesian..	6	300·1	..	..	3	324·9	3	272·7	2	412·2	..	..	6	411·9	20	344·5	408·0
21. Clark, W. J. ..	Jersey ..	4	305·9	2	291·2	2	320·5	1	361·9	2	362·7	1	303·2	5	371·4	17	335·0	394·8
22. Harvey, T. ..	,, ..	16	277·3	2	327·0	4	297·5	2	284·3	1	204·9	..	..	9	379·7	34	308·0	393·9
23. Hurrey, Estate late W. H.	,, ..	5	295·6	..	..	2	329·8	..	..	3	338·2	3	378·1	7	346·6	20	335·6	385·1
24. Alston, Mrs. N. B. and Sons	,, ..	6	232·4	2	316·8	1	307·2	..	..	2	348·1	2	336·8	7	395·2	20	323·6	382·1
25. Crawford, Mrs. E.	,, ..	6	251·3	2	295·4	2	328·3	2	320·0	1	360·3	1	298·0	2	380·6	16	300·9	380·2
26. Parker, L. M. ..	Dairy Shorthorn	1	231·8	3	295·4	..	..	2	313·2	4	324·6	1	386·6	4	366·7	15	326·4	377·1
27. Butcher, F. T. ..	Red Poll	7	222·2	1	241·6	1	321·0	2	270·7	1	336·7	3	390·2	4	417·5	19	307·2	374·5
28. McErvale, I. and Sons	Jersey ..	5	293·0	1	338·5	4	299·6	..	..	..	..	..	..	9	336·4	19	317·4	373·0
29. Shearn, J. ..	,, ..	5	257·3	3	201·4	4	281·5	..	..	1	336·9	1	369·7	1	341·4	15	271·0	356·3
HERDS OF 10 TO 14 COWS.																		
1. Goddard, J. H...	Ayrshire	1	483·8	..	..	1	591·8	1	769·8	2	463·7	..	..	5	444·5	10	499·5	533·5
2. Masters, S. H. and Son	Jersey ..	2	325·3	1	482·1	3	416·4	..	..	1	517·1	..	..	5	485·5	12	443·9	495·5
3. Mitchell, R. H.	,, ..	2	376·9	1	384·9	..	..	2	466·4	..	..	3	457·5	5	476·6	13	448·2	491·3
4. Nancarrow Bros.	,, ..	7	362·2	4	355·1	..	..	2	467·6	..	..	..	..	1	585·1	14	391·1	488·3
5. Powell, T. S. ..	,, ..	4	355·5	..	..	1	498·7	..	..	2	395·3	1	305·9	4	515·4	12	423·2	478·2
6. Broad, A. J. ..	,, ..	3	350·4	1	371·3	2	383·4	1	447·5	1	430·4	..	..	2	427·2	10	392·2	464·2
7. Gay, R. G. and Son	,, ..	6	276·4	..	..	..	..	..	..	2	500·1	..	..	4	521·6	12	395·4	462·1
8. Fixter, A. ..	Guernsey	3	321·6	..	..	4	343·6	..	..	..	..	..	..	4	465·9	11	382·1	443·9
9. Macauley, C. W.	Jersey ..	1	335·4	3	342·9	1	382·4	1	386·5	..	..	3	421·0	2	362·0	11	374·6	430·9
10. Black Estate late I. S.	Ayrshire	4	273·6	2	345·6	..	..	2	379·1	1	359·5	2	412·5	2	437·5	13	354·1	421·8
11. Chadderton, J. E.	Jersey ..	3	316·6	..	..	2	399·7	2	349·8	..	..	2	352·3	4	399·8	13	365·6	417·9
12. Phillips, J. H. ..	,, ..	7	293·8	1	268·5	1	386·4	..	..	..	..	2	359·4	1	445·7	12	323·0	411·3
13. Tait, W. G. ..	,, ..	5	309·8	2	322·6	..	..	..	..	..	..	1	430·5	2	321·5	10	326·8	408·8
14. Tandberg, G. and Son	Illawarra Shorthorn	2	339·1	2	391·4	2	339·9	..	..	..	..	..	..	7	356·0	13	356·4	402·6
15. Huffer, J. A. ..	Jersey ..	6	271·3	2	308·3	1	336·6	1	365·5	1	406·5	..	..	2	379·0	13	316·2	400·8
16. Langlands, F. B.	,, ..	4	305·0	..	..	2	402·5	1	311·6	1	349·6	1	329·8	1	209·8	10	322·6	398·6
17. Fadersen, J. H.	,, ..	..	..	..	..	3	323·9	1	265·0	2	333·6	3	304·8	3	390·5	12	332·5	369·2
18. Wade, W. J. ..	,, ..	1	301·5	..	..	..	..	2	374·3	..	..	2	311·6	6	322·1	11	327·8	353·3

Messrs. F. A. and L. Williams' "Ballara Bonnie" (extreme left) and some of her high-producing descendants.

Advanced Register of Merit

Standard for Pure-bred Cows

By W. J. YUILL, Supervisor of Herd Testing

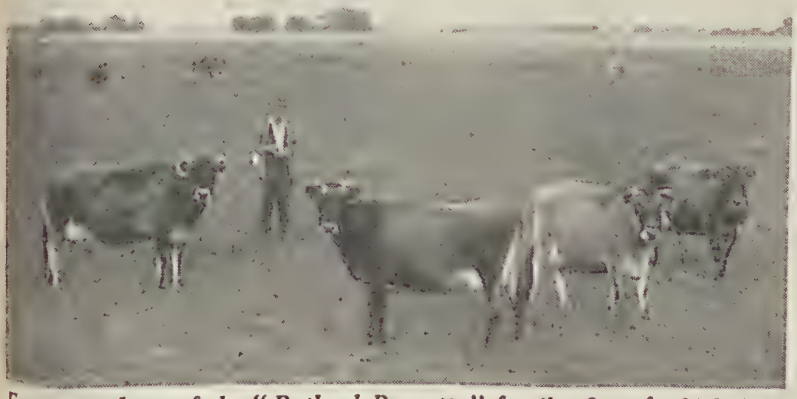
DURING the past year, no fewer than 72 cows qualified for admission to this, the third issue of the Standard Herd Test Advanced Register, while the life-time yields of many cows on the list have been increased.

Considerable interest is being shown in the register by breeders in the test, as well as by the farmers who first made inquiries for such a register. The breeders have realized that the standards set out are well within the reach of the majority of good test cows.

Some who, at first, criticized the plan on the ground that the Annual Report gave all the information needed, had overlooked the fact that, while the Annual Report includes all tested cows, irrespective of any qualification whatever, the purpose of the Advanced Register is to give special recognition to the better-than-average individuals of the mass of tested cows.

It was thought at first that the standards set were too high; but the fact that over 60 per cent. of the qualified cows have produced above the 450-lb. butterfat level originally recommended for a special class has corrected this opinion. Any lingering doubt concerning the soundness of the age-correction factors in use—these were worked out from a survey of the yields of all normal animals in the Standard Herd Test over a perior of 26 years—has been answered by the table included in the last year's Annual Report, wherein it was shown that, when these factors were applied to the average yield of each age group, it was sufficient to raise it above the mature-cow level. It may be assumed that, if these factors can be safely applied to the average yield of all the cows of a certain age, it is sufficiently liberal to apply to the varying ages of the average cow. This is just what was proved in the extensive survey referred to.

The 400-lb. age—corrected—yield of butterfat in a period of four consecutive years, is not a difficult task for a good pure-bred cow. This level is very little above the actual average yield of all mature cows in a normal dairying season. Although, through accident or disease, some really good cows may fail to make the needed sequence of yields, or may fail to qualify by a few days, or a few pounds of butterfat, there is no good reason why special recognition should be denied those cows that do qualify.



Four members of the "Rutland Brunette" family, five of which have qualified to be placed on the advanced register.

An inherent weakness of any system that provides for minimum standards is that all falling below the level set must be excluded. In the Standard Herd Test Advanced Register, care has been taken to set the level low enough to accommodate good average cows. Some critics considered the four-year period allowed for qualification to be over-long. After all, the annual re-calving of dairy cows is an important feature on the majority of farms, particularly where seasonal milking is the custom. Extensive work done by Sanders, of the Cambridge University, showed that practically all the cows covered by this survey calved annually. In a survey made by the Department of Agriculture, it was shown that nearly 20 per cent. of the herds were first calvers. The position in New Zealand appears to be somewhat similar, for recent investigation into herd wastage indicates that, from various causes, nearly 20 per cent. of the cows go out of the herds annually. If, then, the average cow remains in the herd for approximately five years, it is reasonable to expect a sound healthy cow to continue in good dairy form for at least four years.

For some time past, there has been a decided tendency to associate cow health with cow yields. It is obvious that a cow with a low resistance to disease is unlikely to become a noted long-lived producer. On the other hand, a regular calving long-lived cow cannot be appreciated if her yields are unprofitable.

Many of the best features of modern dairying thought are featured in the Advanced Register. Life time yields of milk and butterfat are especially emphasized. The highest yield of each cow is given, together with her best consecutive four years age-corrected yield above 400 lb. butterfat. A record of many years of useful dairy life suggests a high degree of resistance to herd dis-

A group of advanced register cows in Mr. F. T. Butcher's "Maryville" Red Poll stud, Swan Hill.

This group of "Willow Park" shorthorns is owned by Mr. W. K. Atkinson, Swan Hill. Each cow has qualified for inclusion in the register, and has exceeded 60 lb. milk in 24 hours.

orders and disease, while it is the best of all evidence of her fecundity and productivity.

Australia is the only country in the world where the herd test period is restricted to 273 days. Because of this, it is not possible to make fair comparisons with international performances of great life-time producers. The majority of our good cows are still producing above 20 lb. of milk daily when they finish their 273-day test, while, in some instances, more than 60 lb. has been recorded in this State.

A perusal of the register, which appears at the end of this article, indicates that last year's leaders have generally maintained their positions.

However, an upset may come at any time, even for the highest placed cow, for the splendid records now being made by "Inverurie Blue Belle" and "Yarraview Benefactoress" suggest an unusually high ranking on the register when their fourth lactation has been completed.

Prior to the completion of the thirteenth lactation by "Linga Longa Wattle Speck," the long-distance producer of the Standard Herd Test was the twin Shorthorn cow, "Willow Park Blush," whose twelve yields aggregated 4,060 lb. butterfat. Old "Wattle Speck," with 5,920 lb., looks quite fresh despite her long life of usefulness.

Cows like "Mornmoot Princess Madeira," her daughter, "Mornmoot Princess Madeira 3rd," and "Ballara Bonnie"—who a few years ago were holding the leading State positions—are still yielding more than 500 lb. butterfat. It is quite within the bounds of possibility that they will outstrip the long period record held by "Cherry" since 1932, and now endangered by Messrs. T. M. Noble and Sons' remarkable old cow, "Linga Longa Wattle Speck."

A reminder is given here to breeders who are now returning to the Standard Herd Test, that any live qualified cow owned by them will appear on the Register, also that cows now dead, which had qualified, will appear once. This statement was made in the first issue of the Register, and the service will be continued, for breeders and farmers are seeking in the pedigree of tested stock, the evidence of longevity and continued production. The assistance of breeders is sought in regard to information of such cows. The register from year to year, will show important changes in position, because of the good records of newly qualified cows, and/or because of better records of previously qualified ones.

The full list of cows which have qualified to be placed on the Advanced Register of Merit follows this article.

Advanced Register of Merit for Standard Herd Test. (273 Day Period of Test.)

For greater facility of reference, cows are grouped according to breed, the order of cows within the group being according to yield. The minimum yield is an equivalent of 400 lb. butter-fat per cow over four consecutive years of test. In arriving at the equivalent, allowances are credited to immature animals as follows:—

Two-year-olds receive 30 per cent.; three-year-olds receive 20 per cent.; and four-year-olds receive 10 per cent. allowance.

In the life-time section, where the total number of records to date are considered, it may be inferred that the cow has calved regularly since calving first as a two-year-old—when three junior records are indicated—where four are shown, it is evident that first calving occurred at a very early age.

Name of Cow with Herd Book No.	Production Attainment (Average of Four Best Consecutive Yields).	Details to Date of Life Time. (No age allowances.)						Details of Breeding.		Name of Owner.
		Date of Birth.	No. of Test Records.		Highest Individual Record.	Average Yield over all Lactations.		Name and H.B. No. of Sire.	Name and H.B. No. of Dam.	
	B.-fat (lb.).		Under 5 yrs.	Over 5 yrs.	Fat (lb.).	Milk (lb.).	B.-fat (lb.).			
AYRSHIRES.										
Donside Lydo Lady (23657) ..	628	16.10.29	1	5	748	12,838	598	Olivedale Chum (6341) ..	Donside Loco Lady (23656)	J. H. Goddard
Donside Thistledown 2nd (23662)	515	29.9.29	1	4	649	11,234	492	Olivedale Chum (6341) ..	Donside Thistledown (23661)	J. H. Goddard
Glencorren Violetta (20120) ..	485	27.7.28	3	5	506	9,896	407	Glen Athol Jimmie (6211)	Glen Athol Violet (13652)	B. G. Tomasetti
Glencorren Foam (21505) ..	477	7.8.29	3	4	481	8,538	423	Glen Athol Brilliant (6729)	Glen Athol Fashionable (12242)	B. G. Tomasetti
Inverurie Maggie (27417) ..	444	17.7.32	2	4	672	8,996	419	Oakbank Radio (5983) ..	Donside Mary (23659) ..	J. H. Goddard
Carracoorte Brownie's Belle (23547)	419	19.8.29	3	4	483	6,771	362	Carracoorte Gertie's Producer (5502)	Carracoorte Brownie (13604)	W. Henderson
Glencorren Belle (28444) ..	406	7.8.33	3	2	419	7,789	357	Gowrie Park Scottish Emblem (9290)	Glencorren Joy Belle (22831)	B. G. Tomasetti
DAIRY SHORTHORNS.										
Willow Park Melba 15th (1315E) ..	500	22.3.33	3	2	484	9,973	446	Willow Park Lustre 3rd (620F)	Willow Park Cherry (1227E)	W. K. Atkinson
Willow Park Damsel 3rd (1264E) ..	493	3.9.32	3	3	470	10,639	455	Willow Park Imperial 3rd (613F)	Willow Park Damsel 2nd (1263E)	W. K. Atkinson
Willow Park Damsel 2nd (1263E) ..	492	7.10.26	3	5	542	10,906	480	Willow Park Reflector (629F)	Willow Park Damsel (1262E)	W. K. Atkinson
Willow Park Countess 9th (1244E)	483	30.8.30	2	5	489	11,043	453	Willow Park Imperial 2nd (612F)	Willow Park Countess 4th (1240E)	W. K. Atkinson
Willow Park Countess 10th (1245E)	480	17.2.31	3	4	553	11,565	449	Willow Park Reflector (629F)	Willow Park Countess (1237E)	W. K. Atkinson
Drumneil Lily (775E)	472	17.10.32	2	3	551	12,157	483	Willow Park Reformer (253F)	Drumniel Queenie (785E)	Meaklim Bros.
Willow Park Countess 17th (534D)	471	27.10.34	3	1	525	11,089	417	Wicklesham Lord Barrington 5th (Imp.) (153A)	Willow Park Countess 8th (1243E)	W. K. Atkinson
Willow Park Comet 7th (1231E) ..	467	12.12.29	3	5	497	11,642	430	Willow Park Design (579F)	Willow Park Comet 2nd (1228E)	W. K. Atkinson
Willow Park Melba 11th (1311E) ..	457	20.8.32	4	2	481	9,924	393	Willow Park Imperial 3rd (613F)	Willow Park Melba 6th (1306E)	W. K. Atkinson

Advanced Register of Merit for Standard Herd Test. (273 Day Period of Test)—*continued.*

Name of Cow with Herd Book No.	Production Attainment (Average of Four Best Consecutive Yields).	Details to Date of Life Time. (No age allowances.)						Details of Breeding.		Name of Owner.
		Date of Birth.	No. of Test Records.		Highest Individual Record.	Average Yield over all Lactations.		Name and H.B. No. of Sire.	Name and H.B. No. of Dam.	
	B.-fat (lb.).		Under 5 yrs.	Over 5 yrs.	Fat (lb.).	Milk (lb.).	B.-fat (lb.).			
***Dairy Shorthorns*—continued.**										
Drumniel Nellie 3rd (779E) ..	457	21.2.33	3	3	454	11,033	395	Willow Park Reformer (253F)	Drumniel Nellie (777E) ..	Meaklim Bros.
Willow Park Comet 14th (528D) ..	435	22.7.34	3	2	436	9,566	383	Wicklesham Lord Barrington 5th (Imp.) (153A)	Willow Park Comet 7th (1231E)	W. K. Atkinson
Willow Park Duchess 6th (1286E)	432	16.9.33	3	2	430	9,076	387	Willow Park Imperial 3rd (613F)	Willow Park Duchess 7th (1268E)	W. K. Atkinson
Willow Park Comet 9th (1233E) ..	431	3.4.32	3	2	406	9,193	355	Willow Park Imperial 3rd (613F)	Willow Park Comet 7th (1228E)	W. K. Atkinson
Drumneil Queenie (785E) ..	430	27.9.24	..	5	461	10,273	429	Willow Park Rosemont (256F)	Willow Park Queenie (1341E)	Meaklim Bros.
Drumneil Roany 2nd (788E) ..	427	10.10.31	2	2	434	9,192	398	Willow Park Reformer (253F)	Drumneil Roany (787E) ..	Meaklim Bros.
Willow Park Melba 22nd (1321E) ..	424	3.9.34	3	2	432	9,995	382	Willow Park Lustre 3rd (620F)	Willow Park Melba 11th (1311E)	W. K. Atkinson
Willow Park Damsel 5th (1266E) ..	418	25.9.34	4	1	422	8,949	341	Wicklesham Lord Barrington 5th (Imp.) (153A)	Willow Park Damsel 2nd (1263E)	W. K. Atkinson
Willow Park Duchess 7th (1268E)	409	7.10.25	3	7	443	8,588	362	Willow Park Count (383E)	Willow Park Duchess (196F)	W. K. Atkinson
FRIESIANS.										
Darenth Black Rose (2727) ..	617	24.12.25	3	4	764	15,159	547	Springfield Champion (739)	Springfield No. 9 (1070)	E. L. Smith and Sons
Victoria Belfry (5104)	541	26.5.34	3	1	557	12,918	476	Victoria Joyous Mercedes (985)	Victoria Tinkle Bell (3266)	State Research Farm
Victoria Quilt (3767)	520	26.2.29	3	4	586	12,141	492	Victoria Topnote (674) ..	Victoria Patchwork (1706)	State Research Farm
Greenvale Segis Patch (3495) ..	500	24.11.28	1	4	637	14,324	486	Lydholm Segis Paxton (386)	Burnbank Spring Patch (1819)	M. T. Hore
Victoria Songstress (3768) ..	483	23.8.29	2	4	526	14,691	452	Victoria Joyous Mercedes (985)	Victoria Song Belle (1708)	State Research Farm
Victoria Woodcrest Daisy (5112)	472	24.10.32	3	3	536	11,193	404	Victoria Joyous Mercedes (985)	Victoria Song Belle (1708)	State Research Farm
Warwick Maggie Woodcrest (C.R.)	459	28.2.33	3	2	636	14,359	447	Greenvale Woodcrest Oakwood 2nd (1470)	Burnbank Maggie Alcartra (3392)	C. S. Walker
Elmar Ideal Patch (3973) ..	405	28.2.31	3	4	432	11,445	353	Greenvale Oakwood Posch (1148)	Greenvale Segis Patch (3495)	M. T. Hore
GUERNSEYS.										
Clara's Fashion 7th (Imp.) (6652)	573	26.12.32	3	2	663	10,831	511	Sunrise of Maple Lodge (5569)	Clara's Fashion (21421) ..	Capt. A. E. T. Payne
Yarraview Delight (5167) ..	480	25.8.32	2	2	486	8,739	448	Camilla's Majestic of Maple Lodge (Imp.)(2544)	Clara 2nd of Maple Lodge (Imp.) (3932)	Capt. A. E. T. Payne
Avonview Dulcie (2537) ..	449	3.1.30	4	4	481	6,840	387	Melbourne Sandboy 6th (1389)	Fernleigh Daphne (2680)	A. Fixter
JERSEYS.										
Mornmoot Princess Madeira (37071)	810	24.2.31	4	4	794	10,825	618	Werribee Grandmaster (6052)	Werribee Princess Madeira 2nd (33143)	R. M. Chirnside
Mornmoot Princess Madeira 3rd (45269)	755	11.1.33	3	3	734	11,254	653	Staghorn Larkspur's Majestic (8683)	Mornmoot Princess Madeira (37071)	R. M. Chirnside
Rintoul View Petal (37339) ..	695	18.9.30	4	2	624	9,571	564	Banyule Triplane (5753) ..	Relbia Lucy (15737) ..	N. H. Enders

Mornmoot Fancy Starbright (45256)	678	20.4.33	3	3	705	10,023	601	Werribee Prince Madeira (6054)	Brucevale Fancy Starbright 2nd (25802)	R. M. Chirnside
Ballara Bonnie (33911)	674	19.7.29	3	6	691	9,078	591	Brucevale Lord Fancy Madeira (7920)	Garenne 2nd of Brucevale (17719)	F. A. and L. Williams
Werribee Stellar Princess (37073) ..	664	20.10.29	4	1	736	10,206	587	Werribee Butter King (4802)	Werribee Lady Starbright (21179)	G. E. Hodgins
Mornmoot Clementine (41121) ..	641	6.1.32	4	2	566	8,682	514	Werribee Prince Madeira (6054)	Melrose Clementine (28551)	T. S. Powell
Belgonia Eileen 2nd (42921) ..	633	15.8.32	3	3	696	10,412	598	Duke of the Lake (Imp.) (7805)	Eileen 2nd of Clarendon Eyre (13521)	Devon Stud Park Farm
Finchley Canary 3rd (37992) ..	632	18.9.29	3	5	635	8,734	523	Werribee Lord Burnham (5760)	Canary 2nd of Listerfield (10431)	T. M. Noble and Sons
Mornmoot Princess Madeira 5th (49660)	626	11.12.33	4	2	571	7,965	505	Werribee Jupiter (9074) ..	Mornmoot Princess Madeira (37071)	C. S. Grice
Grangelea Rose (33040)	623	27.9.29	3	4	567	9,427	480	Banyule Airo (5751) ..	Grangelea Roseleaf 2nd (26394)	Mrs. A. A. Broad
Tooravale Princess 9th (46479) ..	618	31.10.30	3	4	627	8,609	524	Tooravale Gold Speck (5446)	Princess 2nd of Strathbow (12206)	J. E. Handbury and Son
Leven Brae Perree's Girl (34002) ..	614	10.9.29	4	3	573	8,736	494	Werribee Gaypiece (4823)	Twylish's Perree of Leven Brae (21276)	C. S. Grice
The Wattles Petal (55522) ..	614	26.8.34	3	2	614	8,807	527	Banyule Supine (7998) ..	Rintoul View Petal (37339)	N. H. Enders
Bamawm Primrose (47102)	614	1.9.33	3	2	672	10,264	553	Bamawm Bonnie Boy (10343)	Wompini Rose Marie (29485)	F. A. and L. Williams
Studleigh Master's Kirsty (33077) ..	609	15.8.29	3	2	550	8,425	482	Studleigh Masterpiece (5961)	Kirsty 5th (4100) ..	A. O. Foster
Rydon May Queen 2nd (55151) ..	599	18.8.33	3	3	648	10,036	527	Melrose Migrant (6874) ..	Elanora May Queen 2nd (38289)	E. J. Vagg
Belgonia Junette 3rd (56321) ..	590	5.8.35	3	1	611	9,489	521	Design's Ruler (Imp.) (7804)	Belgonia Junette (30029)..	P. J. Maloney
Springhurst Tomato 3rd (38110) ..	587	24.6.30	3	4	564	8,195	495	Starbright's Prince of Glen Iris (3345)	Tomato of Springhurst (18939)	Estate of the late J. D. Read
Rintoul View Rosemary (38214) ..	582	3.10.30	3	3	579	7,911	474	Banyule Triplane (5753)..	Relbia Pinkie (25169) ..	N. H. Enders
Aveley Marie Antoinette 2nd (25648)	581	12.10.27	1	3	607	10,173	568	Marc Antony of Aveley (4142)	Marie Antoinette of Aveley (18496)	W. J. Wade
Mornmoot Fancy Madeira (37059)	578	28.1.31	4	..	607	8,641	475	Werribee Prince Madeira (6054)	Brucevale Fancy Madeira 2nd (25801)	W. G. Tait
Somerville Ramona (28781) ..	577	19.10.28	2	3	624	7,985	529	Banyule Aeronaut (5754)..	Princess Wynn of Somerville (14159)	O. Ronalds
Avalon Starbright's Duchess (47062)	576	22.8.32	3	3	611	8,595	529	Brucevale Lord Starbright 3rd (9297)	Avalon Duchess (18612) ..	F. Austin
Clifford Farm Lady Sarah (34264) ..	572	31.1.30	3	2	529	7,714	481	Clifford Farm Eliminator (6120)	Linden Rita 4th (8439) ..	R. H. Mitchell
Belgonia Design's Eileen (51698) ..	571	18.8.34	3	2	562	8,059	497	Design's Ruler (Imp.) (7804)	Belgonia Eileen (38827) ..	P. J. Maloney
Strathbow Goldie 5th (26155) ..	571	26.3.28	3	3	617	7,742	517	Studleigh Noble (5146) ..	Goldie of Strathbow (9645)	F. Raggatt
Kooreena Carrie 4th (49033) ..	569	18.9.32	3	1	549	7,787	503	Kooreena Carrie 3rd's Halo (9676)	Kooreena Carrie 2nd (34100)	Estate of the late W. H. Hurrey
Mer Vue Choice Contralto (63047) ..	568	29.9.35	4	..	538	7,592	473	Berrington Largo (9236) ..	Mer Vue Choice 2nd (45131)	F. W. Clarke
Myrtle Point Songstress (45341) ..	561	10.12.31	3	3	604	10,369	523	Werribee Master King (9084)	Songstress 10th of Brookfield (21571)	R. G. Gay and Son
The Wattles Princess 4th (50857) ..	559	17.11.33	4	2	504	8,073	460	The Wattles Biplane (8758)	The Wattles Princess 2nd (33990)	N. H. Enders
Mornmoot Satisfaction 2nd (49661)	555	2.4.34	3	1	630	8,565	492	Werribee Jupiter (9047) ..	Werribee Princess Satisfaction (28543)	R. M. Chirnside
Rutland Brunette 16th (64153) ..	554	10.8.35	3	1	624	8,776	491	King's Vale Lauder (10792)	Rutland Brunette 3rd (41919)	S. H. Masters and Son
Monterey Melody's Mascot (58530)	552	20.6.34	3	1	583	9,419	487	Rosecliff Mariposa's Master (9127)	Mornmoot Melody 2nd (33134)	T. S. Powell
Mer Vue Choice 4th (58404) ..	550	30.8.33	3	2	502	7,570	464	Woorayl Flashlight (5375)	Wood Choice (28590) ..	F. W. Clarke
Belgonia Suspense 6th (56325) ..	547	12.8.35	3	1	546	8,084	480	Design's Ruler (Imp.) (7804)	Belgonia Suspense (42698)	C. S. Grice
Ballara Lassie 3rd (42861) ..	542	23.9.31	3	2	487	8,224	459	Brucevale Lord Fancy Madeira (7920)	Ballara Lassie 2nd (18999)	E. Hore
Avalon Madeira's Duchess (56188)..	540	28.5.35	3	1	529	8,670	475	Mornmoot Prince Madiera (11919)	Avalon Noble's Duchess 3rd (47058)	F. Austin
Springhurst Sybil Tulip (55281) ..	539	29.9.34	4	1	513	7,544	442	Springhurst Golden Gamboge (11114)	Tulip 4th of Springhurst (21611)	Estate of the late J. D. Read
Mornmoot Fancy Madeira 4th (54245)	539	7.11.34	3	1	498	7,863	459	Werribee Madeira's Ace (11223)	Mornmoot Fancy Madeira (37059)	R. M. Chirnside
Strathbow Heatherbelle (29326) ..	538	29.7.28	3	5	546	6,792	450	Studleigh Noble (5146) ..	Maylands Heatherbelle (26150)	J. O'Neill

Advanced Register of Merit for Standard Herd Test. (273 Day Period of Test)—*continued.*

Name of Cow with Herd Book No.	Production Attainment (Average of Four Best Consecutive Yields).	Details to Date of Life Time. (No age allowances.)						Details of Breeding.		Name of Owner.
		Date of Birth.	No. of Test Records.		Highest Individual Record.	Average Yield over all Lactations.		Name and H.B. No. of Sire.	Name and H.B. No. of Dam.	
	B.-fat (lb.).		Under 5 yrs.	Over 5 yrs.	Fat (lb.).	Milk (lb.).	B.-fat (lb.).			
***Jerseys*—continued.**										
Ballara Bluebell 4th (38007) ..	537	17.9.30	3	3	519	8,232	455	Brucevale Lord Fancy Madeira (7920)	Ballara Bluebell (26250)	J. O'Neill
Mornmoot Modesty 2nd (33138) ..	533	27.7.29	3	4	543	7,353	416	Choirmaster of Banyule (2712)	Queen Jessie of The Falls (17812)	K. E. Watson
Bellaire Molly 8th (37975) ..	533	21.3.30	3	5	585	8,751	496	Werribee Fancy Clementine King (3109)	Molly 5th of Bellaire (28586)	Nancarrow Bros.
Springhurst Coronation Narcissus (50625)	533	21.4.34	3	2	585	8,252	456	Springhurst Design's Analyst (11112)	Springhurst Sybil Narcissus (46191)	Estate of the late J. D. Read
Victoria Flirt (33272)	532	21.3.30	3	5	614	7,421	474	Victoria Jack Tar (6663)	Victoria Charm (28657) ..	Dept. of Agric., Burnley
Mer Vue Choice 3rd (54081) ..	532	21.7.33	3	2	532	7,695	462	Woorayl Flashlight (5375)	Mer Vue Choice 2nd (45131)	F. W. Clarke
Monterey Maid's Mermaid (58528)	531	24.6.34	3	1	608	9,070	466	Rosecliffe Mariposa's Master (9127)	Mornmoot Maid (33125)	T. S. Powell
Inverbroom Silvermine's Marie (44392)	531	16.9.32	3	3	598	8,879	408	Economist of Aveley (4522)	Aveley Marie Antoinette 2nd (25648)	W. J. Wade
Barrowby Rose Fancy (56280) ..	529	2.3.34	4	1	541	7,709	424	Wompini Twylight (10227)	Marimba Briar Rose 3rd (29567)	E. L. Jeffreson
Jerseyinn Nasturtium 3rd (37995)	529	7.10.29	4	..	494	7,351	429	Werribee Bluebell's Masterpiece (5569)	Glen Iris Nasturtium (18790)	T. M. Noble and Sons
Springhurst Sybil Soya (50634) ..	529	17.4.34	3	2	601	9,250	468	Bellefaire Seaborn Successor (6824)	Springhurst Soya (38107)	Estate of the late J. D. Read
Avalon Starbright's Beauty (51560)	527	15.11.34	3	1	531	7,339	429	Brucevale Lord Starbright 3rd (9297)	Avalon Gladstar's Beauty 5th (36821)	F. Austin
Normandie Buttercup 2nd (33188)	524	13.7.29	4	6	486	7,063	402	Peer of Lewisham (4483)	Buttercup of Hazelbrook (18665)	L. W. R. Colenso
The Wattle's Silvermine 2nd (55525)	524	24.7.34	3	2	514	8,005	466	Woodside Chrissy's Gamboge (11251)	The Wattle's Silvermine (46425)	N. H. Enders
Turro Park Eminent Duchess (33240)	520	24.7.30	4	3	474	7,832	416	Aveley Drummer (7719)	Turro Park Graceful Duchess (21313)	Mrs. E. Crawford
Avalon Starbright's Pansy 4th (56189)	520	1.6.35	4	..	522	7,850	448	Brucevale Lord Starbright 3rd (9297)	Avalon Gladstar's Pansy 6th (38723)	F. Austin
Linga Longa Wattle's Speck (25574)	519	1.11.26	4	9	558	8,410	455	Canary Handsome Boy of Linga Longa (5072)	Speck of Linga Longa (21113)	T. M. Noble and Sons
Boorene Silver Light (25542) ..	519	7.3.28	3	7	519	7,319	438	Lady Grey's Silvermine 2nd of Somerset (3497)	Silvermine's Clara of Boorene (25250)	G. A. McNabb and Son
Monterey Maid (49602)	516	30.9.32	2	3	534	9,946	488	Mornmoot Starbright King (6572)	Mornmoot Maid (33125)	T. S. Powell
Elm Grove Buttercup (21303) ..	514	2.8.25	2	3	553	8,884	470	Gold Star of Melrose (4248)	Dairymaid 5th of Waterloo Farm (17743)	R. G. Gay and Son
Taranah Rainbow (42118) ..	514	3.12.30	4	4	487	7,037	396	Duke of Invermay (3693)	Taranah Roseleaf 2nd (29086)	C. W. Macauley
Taranah Floss (37857)	514	30.8.29	4	3	530	7,524	435	Duke of Invermay (3693)	Taranah Fairy (16716) ..	C. W. Macauley
Mornmoot Clementine 3rd (54243)	514	5.2.35	4	..	487	7,367	411	Werribee Madeira's Ace (11223)	Melrose Clementine (28551)	T. S. Powell
Troed-yr-Rhiw Cariad 2nd (50927)	513	1.7.32	3	3	523	7,935	441	Montrose Duke of Glen Iris (6090)	Troed-yr-Rhiw Cariad (23266)	T. J. Dunmore
Selsey Rose (41947)	513	1.6.31	3	3	504	7,639	426	Jubilee Asterlight (7860)	Jubilee Ranunculus (26186)	M. A. Nicholas
Avalon Starbright's Pansy 5th (56190)	511	3.8.35	4	..	486	7,901	419	Brucevale Lord Starbright 3rd (9297)	Avalon Mercedes Pansy 6th (28405)	F. Austin
Bamawm Fancy Gem (47100) ..	510	29.8.33	3	3	591	7,645	459	Bamawm Leon (9108) ..	Ballara Garemne's Fancy 6th (38780)	F. A. and L. Williams

Clifford Farm Gladsome (32965) ..	510	1.1.32	3	4	718	7,982	498	Clifford Farm Eliminator (6120)	Linden Rita 4th (8439) ..	R. H. Mitchell
Tooravale Lassie 17th (55580) ..	510	21.9.33	4	..	482	7,292	420	King's Vale Monica 14th's Son (6625)	Tooravale Lassie 2nd (25904)	J. E. Handbury and Son
Avalon Starbright's Duchess 2nd (51561)	509	4.10.34	3	1	551	8,458	445	Brucevale Lord Starbright 3rd (9297)	Avalon Noble's Duchess (32908)	F. Austin
Belgonia Design's Noella (42697) ..	508	16.7.31	3	3	479	7,763	424	Design's Ruler (Imp.) (7804)	Gem's Noella (Imp.) (33497)	Devon Park Stud Farm
Taranah Radiance 2nd (59634) ..	508	18.3.35	4	..	527	7,477	417	Taranah Commander (8913)	Taranah Radiance (37858)	C. W. Macauley
Avalon Starbright's Pansy 3rd (51563)	507	2.8.34	3	1	543	7,703	443	Brucevale Lord Starbright 3rd (9297	Avalon Mercedes Pansy 6th (28405)	F. Austin
Bamawm Pretty Lady (56239) ..	506	2.10.34	4	1	634	7,447	440	Bamawm Master Gaypiece (11338)	Bamawm Bonnie Lass (47099)	F. A. and L. Williams
Darnum Park Starbright (61269) ..	504	1.7.35	3	1	490	7,308	410	Darnum Park Starbright's Masterpiece (9383)	Brucevale Fancy Starbright (21180)	A. and W. Shearman
Belgonia Peggy 9th (37898) ..	504	27.7.30	3	4	540	8,746	434	Aveley Rex (6612) ..	Belgonia Peggy 6th (29117)	Nancarrow Bros.
Tavistock Valerie (55444) ..	504	28.10.33	4	1	502	7,041	407	Werribee Ranger (5411)	Tavistock Honesty 3rd (37148)	E. Hore
Springhurst Tecoma 4th (33651) ..	503	29.10.29	4	..	451	6,845	413	Starbright's Prince of Glen Iris (3345)	Tecoma of Springhurst (12225)	Devon Park Stud Farm
Jindivick Heroine 8th (57868) ..	503	12.8.34	3	1	532	9,726	459	Somerville Master Babs (8034)	Somerville Heroine 5th (38134)	O. Ronalds
Springhurst Blonde Romneya (55272)	502	24.3.35	3	1	523	7,444	441	Bellefaire Seaborn Successor (6824)	Springhurst Romneya 3rd (29339)	Estate of the late J. D. Read
Sleepy Valley Milkmaid (59447) ..	501	11.4.32	4	3	470	6,585	394	Holly Dell Twylish (7746)	Melview Milkmaid (29394)	A. and W. Shearman
Studleigh Duchess 3rd (25289) ..	500	17.2.27	4	2	449	6,514	387	Brucevale Lord 5th (3319)	Studleigh Duchess (18653)	W. H. Lyon
Windrest Rose Marie (55878) ..	500	2.11.33	4	1	515	7,104	399	Clarendon Eyre Eminent's Achievement (4154)	Aberdour Rance (23519)	Dr. A. R. Haywood
Coimbra Silvermine (56854) ..	499	6.2.35	4	1	492	8,736	409	Banyule Triplane (5753)	Banyule Silvermine 67th (28848)	H. V. Stirling
Springhurst Gamboge Tomato (55277)	499	22.5.35	4	1	500	8,358	434	Bellefaire Seaborn Successor (6824)	Springhurst Tomato 2nd (26175)	Estate of the late J. D. Read
Kyora Dream Girl (29160) ..	497	8.9.27	3	4	517	8,164	464	Perree's Duke (Imp.) (996)	Dream Girl of Woodside (6395)	Nancarrow Bros.
Taranah Chime (55424)	497	29.12.31	4	2	483	7,118	396	Duke of Invermay (3693)	Taranah Carol (29083) ..	C. W. Macauley
Rutland Brunette 10th (59354) ..	496	16.7.34	3	2	531	8,447	440	King's Vale Lauder (10792)	Rutland Brunette (29130)	S. H. Masters and Son
Bamawm Mayflower (47101) ..	495	9.9.33	3	2	572	8,248	452	Bamawm Leon (9108) ..	Mornmoot Mascot (28555)	F. A. and L. Williams
Springhurst Coronation Nightshade (46183)	495	17.3.32	3	2	476	7,762	436	Design's Ruler (Imp.) (7804)	Springhurst Nightshade 3rd (26170)	Estate of the late J. D. Read
Selsey Wyandotte (41949) ..	495	14.7.31	3	4	522	6,742	458	Werribee Wyandotte's King (6053)	Brucevale Lady Merribee Wyandotte (28545)	M. A. Nicholas
Finchley Handsome Lady 2nd (43886)	494	9.3.32	3	4	504	6,404	438	Finchley Lord Harmony (8078)	Finchley Handsome Lady (73993)	T. M. Noble and Sons
Taranah Flora 2nd (59633) ..	494	7.11.34	4	1	521	7,527	403	Taranah Commander (8913)	Taranah Flora (42117) ..	C. W. Macauley
Leven Brae Gay Countess (40698)	491	16.1.28	4	5	531	8,031	396	Werribee Gaypiece (4823)	Leven Brae Twylish Countess (16641)	E. Hore
Weir View Golden Duchess 2nd (51162)	491	14.9.34	4	..	486	7,593	403	Weir View Laddie 2nd (12328)	Weir View Golden Duchess (51161)	C. S. Walker
Mer Vue Choice 2nd (45131) ..	490	5.8.31	2	4	520	6,824	431	Tooravale Silver Ling (7699)	Wood Choice (28590) ..	F. W. Clarke
Taranah Roseleaf 4th (37589) ..	489	12.10.30	1	5	525	8,385	438	Taranah Submarine (7798)	Taranah Roseleaf (23293)	E. Hore
Mornmoot Modiste 2nd (33140) ..	488	15.4.30	3	4	452	6,064	379	Werribee Prince Madeira (6054)	The Falls Air Beauty (24816)	K. E. Watson
Ballara Model 6th (33837) ..	488	31.8.29	3	2	507	7,077	439	Brucevale Lord Fancy Madeira (7920)	Ballara Model (19000) ..	J. O'Neill
Tooravale Lassie Fowler 14th (50893)	488	25.11.32	3	2	497	7,014	428	King's Vale Monica 14th's Son (6625)	Melrose Lassie Fowler 7th (4542)	J. E. Handbury and Son
Weir View Golden Design (55819)	487	23.8.35	4	..	436	7,515	399	Design's Ruler (Imp.) (7804)	Weir View Golden Duchess (51161)	J. V. Trewin
Brampton Standard Dream 2nd (Imp.) (56047)	487	28.9.34	3	2	507	7,176	418	Brampton Sporting Standard (Imp.) (13432)	Brampton Summer's Dream	M. A. Nicholas

Advanced Register of Merit for Standard Herd Test. (273 Day Period of Test)—*continued.*

Name of Cow with Herd Book No.	Production Attainment (Average of Four Best Consecutive Yields).	Details to Date of Life Time. (No age allowances.)						Details of Breeding.		Name of Owner.
		Date of Birth.	No. of Test Records.		Highest Individual Record.	Average Yield over all Lactations.		Name and H.B. No. of Sire.	Name and H.B. No. of Dam.	
	B.-fat (lb.).		Under 5 yrs.	Over 5 yrs.	Fat (lb.).	Milk (lb.).	B.-fat (lb.).			
					Jerseys—continued.					
Maxon Noble's Alsyke (34221) ..	487	14.3.30	4	4	508	7,785	428	Avalon Noble 8th (5380) ..	Springhurst Alsyke 3rd (16960)	G. A. McNabb and Son
Taranah Rainbow 2nd (64463) ..	487	3.10.35	4	..	514	7,185	401	Werribee Bluebell's Masterpiece (5569)	Taranah Rainbow (42118)	C. W. Macauley
Kantara Ditny's Larkspur (29378)..	485	2.10.28	3	3	479	6,856	410	Ku Ku Fashion Plate (Imp.) (3685)	Dinty of Clarendon Eyre (11651)	C. G. Smith
Lucerne Vale Madeira 3rd (49243) ..	485	8.5.34	4	1	546	6,995	403	Lucerne Vale Grandmaster (10855)	Lucerne Vale Madeira (44927)	N. C. De La Rue
Rosyth Lady Tulip 3rd (38451) ..	484	29.9.29	4	4	504	7,202	414	Lord 2nd of Brucevale (3563)	Rosyth Tulip (20183) ..	E. J. Vagg
Troed-yr-Rhiw Eastern Queen (59794)	482	3.8.34	3	2	467	7,616	415	Clarendon Eyre Oxford Dreamer (10273)	Troed-yr-Rhiw Mifanwy 2nd (37766)	E. Hore
Brucevale Fancy Starbright 3rd (28544)	482	15.7.28	3	4	562	7,168	444	Masterpiece of Brucevale (3824)	Fancy Starbright of Brucevale (24180)	M. A. Nicholas
Werribee Clementine Princess 3rd (24583)	481	15.8.26	3	3	538	7,244	423	Masterpiece (Imp.) (2394)	Werribee Island Clementine 2nd (25465)	M. A. Nicholas
Glen Leigh Duchess 4th (25791) ..	480	1.10.27	2	4	511	7,686	440	Gadabout of Danton (4480)	Duchess 10th of Kyora (6835)	J. E. Chadderton
Grangelea Bell (40060)	479	24.9.31	4	3	505	7,055	407	Grangelea Daffodil's Eyre (7675)	Grangelea Daisy Bell (33034)	Mrs. A. A. Broad
King's Vale Linda 63rd (18672) ..	479	5.10.23	..	5	512	9,791	469	King's Vale Rosella's V.C. (2376)	King's Vale Linda 54th (12853)	R. G. Gay and Son
Kooreena Yo Yo (44759) ..	478	19.9.32	4	2	438	7,418	402	Columbine's Defiance of Linga Longa (4419)	Lulu 5th of Roelands (17438)	Estate of the late W. H. Hurrey
Finchley Lillian (57279) ..	477	27.5.33	2	2	480	6,673	444	Werribee Lord Burnham (5760)	Aveley Lillian 2nd (26199)	T. M. Noble and Sons
Weir View Golden Duchess (51161)	476	2.2.33	3	3	477	8,449	422	Duke of the Lake (Imp.) (7805)	Weir View Wattle Blossom (38428)	J. V. Trewin
Maxon Sweet Estelle (54029) ..	475	8.10.34	4	1	488	6,428	390	Maxon Count Graceful (6754)	Sweet Estelle's Pansy of Boorene (11231)	G. A. McNabb and Son
Rutland Bright Stockings (41918)..	473	11.7.30	4	3	472	7,796	396	St. Alban's Fuchsia's Superior (6115)	Lea Hurst Silk Stockings 5th (26073)	S. H. Masters and Son
Glenvalley Waverley Lass 2nd (24405)	472	30.7.26	3	4	456	6,765	407	Rosebud's Topnote of Glenvalley (4507)	Waverley Lass 3rd of Melrose (6312)	J. A. Huffer
Banyule Silvermine 46th (24466) ..	471	19.4.27	3	2	462	7,697	410	Wooton Airman (Imp.) (2716)	Banyule Silvermine 29th (14195)	H. V. Stirling
Milvue Twylish Bettwys (58470) ..	471	20.6.34	3	2	473	8,130	414	Milvue Christmas Melody (10900)	Troed-yr-Rhiw Bettwys 2nd (42295)	E. Hore
Maxon Bright Favourite (45055) ..	471	4.8.32	3	4	605	7,961	427	Maxon Starbright Prince 5th (8912)	Maxon Count's Favourite (37851)	G. A. McNabb and Son
Avalon Gladstar's Daisy 3rd (51558)	470	29.6.34	2	2	481	7,669	439	Avalon Gladstar 2nd (6534)	Avalon Noble's Daisy 2nd (32907)	F. Austin
Jindivik Valda's Lass (62334) ..	469	15.9.34	3	1	442	8,006	409	Somerville Master Babs (8034)	Somerville Princess Valda 2nd (38184)	O. Ronalds
Tooravale Lassie 12th (50891) ..	469	27.8.32	4	..	469	6,923	386	King's Vale Monica 14th's Son (6625)	Tooravale Lassie 5th (28731)	A. J. Turner
Bamawm Mistress Peggy (56238)	469	28.8.34	3	1	507	7,369	412	Bamawm Bonnie Boy (10343)	Mornmoot Mascot (28555)	F. A. and L. Williams
Lynroy Gladys 4th (62866)	468	11.9.35	3	1	516	6,977	397	Werribee Laverock (1985)	Lynroy Gladys (38462) ..	Vaughan Bros.
Tavistock Larkspur (55437) ..	468	7.11.33	3	3	521	7,173	421	Werribee Ranger (5411)	Tavistock May (28611) ..	E. Hore
Pine Ridge Silvermine 2nd (58999)	468	10.11.34	4	..	463	7,503	386	Duke of the Lake (Imp.) (7805)	Banyule Silvermine 27th (11693)	Nancarrow Bros.

Glen Leigh Dora 2nd (28532) ..	467	7.2.29	3	3	500	7,638	446	Gadabout of Danton (4483)	Glen Leigh Duchess 2nd (15463)	J. E. Chadderton
Glen Leigh Dawn 2nd (48264) ..	466	29.9.33	3	2	491	6,851	406	Glen Leigh Bounty (8675)	Glen Leigh Duchess 4th (25,791)	J. E. Chadderton
Kooreena Maranta 7th (40585) ..	466	14.9.31	3	4	471	7,102	417	Columbine's Defiance of Linga Longa (4419)	Kooreena Maranta 2nd (28,775)	Estate of the late W. H. Hurrey
Elm Grove Silverbell (23159) ..	466	28.8.26	3	5	478	6,576	401	Gold Star of Melrose (4248)	Silvermine of Brookside (9724)	R. G. Gay and Son
Sylvan Hill Linda (64410) ..	465	4.10.35	4	..	418	6,577	381	Glen Iris Bow Bells (8052)	Sylvan Hill Dainty 2nd (26361)	Smith Bros.
Maxon Countess Light (49425) ..	465	2.7.33	4	1	735	7,319	451	Maxon Count Graceful (6754)	Boorene Silver Light (25542)	G. A. McNabb and Son
Grangelea Roseleaf 3rd (33041) ..	465	10.9.29	3	3	481	7,439	424	Banyule Airo (5751) ..	Grangelea Rosebud 3rd (18657)	Mrs. A. A. Broad
Tooravale May 7th (59765) ..	463	25.8.34	4	1	441	7,788	384	Tooravale Monica's Son (10121)	Tooravale May 5th (50894)	J. E. Handbury and Son
Kantara Jessamine 2nd (40487) ..	463	15.1.31	4	4	451	7,792	404	Glen Iris Valiant Count (6135)	Kantara Jessamine (29380)	J. H. Phillips
Belgonia Design's Marie 2nd (51700)	463	16.7.34	3	1	463	8,201	403	Design's Ruler (Imp.) (7804)	Belgonia Marie 4th (24491)	P. J. Maloney
Sylvan Hill Duchess (50736) ..	462	28.7.31	2	5	511	7,900	434	Somerville Heir Apparent (5460)	Duchess 4th of Goulburn (11711)	Smith Bros.
Wompini Starbright (60091) ..	461	25.4.34	3	2	500	6,950	419	Werribee Butter King (4802)	Kantara Starbright (40492)	T. S. Powell
Bamawm Princess Pamela (47103)	461	25.9.32	3	3	537	7,033	399	Bamawm Leon (9108) ..	Avalon Gladstar Pansy (28399)	F. A. and L. Williams
Sylvan Hill Opal (59606) ..	460	29.7.34	4	1	498	6,363	396	Jerseyholm Handsome Boy 3rd (6766)	Sylvan Hill Jewel (29487)	Smith Bros.
Ullina Heather Belle 2nd (59830)	460	11.8.34	4	1	497	6,681	397	Kyora Dream's Gadget 2nd (10815)	Ullina Heather Belle (46542)	J. O'Neill
Strathbow Goldie 16th (59521) ..	460	24.10.35	4	..	445	6,784	378	Grangelea Dapper (10655)	Strathbow Goldie 5th (26156)	F. Raggatt
Windrest Twinkle's Adore (64939)	459	16.1.35	3	1	471	6,409	404	Kyora Hero (11805) ..	Kyora Twinkle (49065) ..	Dr. A. R. Haywood
Inverbroom Silver Muriel 2nd (38483)	459	17.9.30	3	5	433	8,209	377	Economist of Aveley (4522)	Avonview Muriel (23140)	W. J. Wade
Elm Grove Dawn (52626) ..	459	11.5.33	3	3	545	7,652	409	Goldstar of Melrose (4248)	Elm Grove Daphne (39640)	R. G. Gay and Son
Kooreena Audrey 8th (49032) ..	458	17.12.33	4	1	435	5,052	366	Kooreena Carrie 3rds Delegate (6081)	Kooreena Audrey 3rd (34099)	Estate of the late W. H. Hurrey
Moxon Noble's Goldfinch (45069)	456	20.7.32	3	3	478	7,181	389	Avalon Noble 8th (5380)	Grangelea Goldfinch 3rd (23004)	G. A. McNabb and Son
Rutland Brunette 12th (59356) ..	456	2.8.34	3	2	487	7,851	445	King's Vale Lauder (10792)	Rutland Brunette 4th (50522)	S. H. Masters and Son
Warwick Augustus Marie (38486)	456	26.9.29	4	5	433	8,072	380	Chevrolet of Banyule (4443)	Boorene Augustus Marie (26295)	C. S. Walker
The Wattles Petal 2nd (59706) ..	455	12.9.35	4	..	453	5,614	370	Selsey Brampton Peer (12159)	Rintoul View Petal (37339)	J. H. Fadersen
Taranah Dahlia 3rd (69221) ..	455	17.8.35	4	..	411	6,363	373	Taranah Reliance (12224)	Taranah Dahlia (50772) ..	C. W. Macauley
Coodardy Gloria 7th (C.R.) ..	454	19.10.33	3	2	554	6,966	391	Tooronga Belle's Bonaparte (12122)	Coodardy Gloria 3rd (37090)	P. W. Clark
Troed-yr-Rhiw Melys 2nd (64658)	454	18.9.33	3	2	447	8,037	405	Troed-yr-Rhiw Masterman (10130)	Troed-yr-Rhiw Melys (26477)	E. Hore
Antimony's Trixie of Belle Vue (15569)	454	12.12.21	..	9	479	7,821	384	Columbine's Antimony (2070)	Trixie of Belle Vue (15280)	J. Moore and Co.
Rutland Brunette 6th (50524) ..	453	18.8.32	4	3	407	7,109	377	Rutland Rover (10015) ..	Rutland Brunette 3rd (41919)	S. H. Masters and Son
Springhurst Hussy Alsyke (50630)	453	11.6.34	3	1	447	6,201	382	Bellefaire Seaborn Successor (6824)	Alsyke 2nd of Springhurst (10437)	Estate of the late J. D. Read
Vaucluse Marie Rose (64739) ..	452	1.7.34	2	2	464	7,433	422	Vaucluse Concentration (11200)	Vaucluse Tilly (37366) ..	Fairchild and Clutterbuck
Glenvalley Silvershine (52946) ..	452	12.9.31	4	3	420	6,578	380	Melrose Ensign (6711) ..	Silversand of Glenvalley (18756)	J. A. Huffer
Kooreena Audrey 7th (49031) ..	452	29.9.33	3	2	435	5,707	377	Kooreena Carrie 3rds Delegate (6081)	Kooreena Audrey 4th (40578)	Estate of the late W. H. Hurrey
Strathbow Goldie 11th (46226) ..	452	6.7.32	1	4	481	8,076	426	Duke of the Lake (Imp.) (7805)	Strathbow Goldie (9645)	F. Raggatt
Lynroy Fancy 4th (62864) ..	452	26.8.34	4	..	465	6,645	372	Werribee Laverock (9085)	Lynroy Fancy (38459) ..	Vaughan Bros.
Belgonia Blossom 7th (29112) ..	451	2.9.27	..	5	484	8,669	433	Ariel of Banyule (4533) ..	Blossom of Belgonia (21490)	J. V. Trewin

Advanced Register of Merit for Standard Herd Test. (273 Day Period of Test)—*continued.*

Name of Cow with Herd Book No.	Production Attainment (Average of Four Best Consecutive Yields). B.-fat (lb.).	Date of Birth.	Details to Date of Life Time. (No age allowances.) No. of Test Records. Under 5 yrs.	Over 5 yrs.	Highest Individual Record. Fat (lb.).	Average Yield over all Lactations. Milk (lb.).	B.-fat (lb.).	Details of Breeding. Name and H.B. No. of Sire.	Name and H.B. No. of Dam.	Name of Owner.
***Jerseys*—continued.**										
Glen Leigh Daphne (48263) ..	451	6.9.34	4	1	456	7,050	382	Glen Leigh Bounty (8675)	Glen Leigh Doris 3rd (37039)	J. E. Chadderton
Maxon Chieftain's Lodestone 2nd (58347)	450	24.5.35	4	..	455	6,493	370	Maxon Chieftain (9752) ..	Maxon Count's Lodestone (40932)	G. A. McNabb and Son
Sylvan Hill Joyful (50738) ..	450	18.7.32	3	4	471	7,504	404	Somerville Heir Apparent (5460)	Sylvan Hill Attractive (33760)	Smith Bros.
Windrest Chevy (42529) ..	450	21.2.32	4	4	561	6,146	379	Edmonton Rarius (3936)	Chevy 13th of Melrose (11775)	Dr. A. R. Haywood
Sylvan Hill Bonnie Mary (55377)	447	14.7.33	3	3	444	6,938	394	Jerseyholm Handsome Boy 3rd (6766)	Sylvan Hill Molly (42093)	Smith Bros.
Sutton Lea Airflier (38134) ..	447	15.12.29	3	4	494	6,394	403	Banyule Petalon 2nd (6185)	Golden Pariel 2nd of Boorene (11227)	W. S. Richardson
Grangelea Rosella 3rd (48528) ..	446	4.8.33	3	1	453	6,857	392	Banyule Macon (6174) ..	Grangelea Rosella 2nd (40067)	Mrs. A. A. Broad
Maxon Graceful Bouvardia (49126)	445	28.2.34	4	2	456	5,624	367	Maxon Count Graceful (6754)	Maxon Bright Bouvardia (37848)	G. A. McNabb and Son
Sylvan Hill Beauty (38227) ..	445	10.8.29	2	7	435	6,017	363	Somerville Heir Apparent (5460)	Sylvan Hill Lily (21670)	Smith Bros.
Maxon Count Lodestone (40932) ..	445	13.6.31	3	4	468	6,016	390	Maxon Count Graceful (6754)	Springhurst Lodestone (21608)	G. A. McNabb and Son
Glen Leigh Destiny 2nd (43973 ..	445	19.3.33	3	3	422	6,646	393	Glen Leigh Bounty (8675)	Glen Leigh Dora (25789)	J. E. Chadderton
Avalon Noble's Pansy 3rd (36833)	442	8.7.30	4	2	431	5,925	370	Avalon Noble (3639) ..	Avalon Gladstar Pansy (28399)	G. A. McNabb and Son
Belgonia Peggy 10th (38831) ..	441	8.9.31	3	4	520	8,260	452	Aveley Rex (6612) ..	Belgonia Peggy 6th (29117)	P. J. Maloney
Rutland Brunette 13th (59357) ..	440	11.8.34	3	2	425	7,301	388	King's Vale Lauder (10792)	Rutland Brunette 6th (50524)	S. H. Masters and Son
Elm Grove Bluebell (33355) ..	439	29.8.28	4	2	422	5,850	369	Elm Grove Royal Lad (5105)	Elm Grove Silverbell (23159)	R. G. Gay and Son
Tiny 3rd of Beverley (21097) ..	439	9.8.25	4	6	501	7,327	392	Rosella's Lad of King's Vale (3106)	Tiny of Beverley (13323)	Dr. A. R. Haywood
Morumoot Stellar Princess (45272)	439	27.10.32	3	2	428	7,334	396	Werribee Prince Maderia (6054)	Werribee Stellar Princess (37073)	T. S. Powell
Orphanage V. C. Molly (36860) ..	438	19.7.29	3	4	429	7,826	372	Wompini V.C. (4550) ..	Tavistock Molly (16240)	Ballarat Orphanage
Glen Leigh Doris 3rd (37039) ..	438	23.1.31	3	3	493	7,422	399	Strathkellar Top Thorn (6049)	Glen Leigh Duchess (15462)	J. E. Chadderton
Ryelands Dainty Maid (64159) ..	437	24.11.35	4	..	419	7,462	359	Ryelands Black Prince (13219)	Peri Vanilla 7th (54746)	J. H. Phillips
Vaucluse Daphne (51012) ..	437	20.9.32	3	1	519	6,010	387	Vaucluse Duke 3rd (10150)	Vaucluse Pansy (42368) ..	Fairchild and Clutterbuck
Milvue Larkspur's Attraction (58464)	435	20.8.35	3	1	502	5,982	344	Clarendon Eyre Eminent's Lion 5th (11477)	Tavistock Larkspur (55437)	E. Hore
Maxon Silver Light (58358) ..	434	26.8.35	4	..	451	5,492	365	Maxon Count Graceful (6754)	Boorene Silver Light (25542)	G. A. McNabb and Son
Sylvan Hill Lady Alma (38282) ..	433	31.7.29	2	7	500	7,304	395	Somerville Heir Apparent (5460)	Sylvan Hill Alma (23444)	Smith Bros.
Maxon Bright Clara (54013) ..	432	11.9.34	4	1	451	6,676	373	Maxon Starbright's Prince 5th (8912)	Maxon Noble's Clara (34222)	G. A. McNabb and Son
Jerseyholm Empress 22nd (37506)	431	23.7.30	2	5	419	7,343	367	Brucevale Lord Island Fancy (4500)	Jerseyholm Empress 4th (13356)	T. Harvey
Sylvan Hill Handsome Girl (33762)	431	27.7.28	2	7	450	6,543	406	Jerseyholm Handsome Boy 3rd (6766)	Sylvan Hill Starlight (23447)	Smith Bros.

Maxon Count's Favourite 3rd (58351)	429	15.9.35	1	..	471	6,480	356	Maxon Count Graceful (6754)	Maxon Bright Favourite (45055)	G. A. McNabb and Son
The Wattles Hazel 2nd (55512) ..	428	22.9.34	3	2	421	7,126	366	Woodside Chrissy's Gamboge (11251)	Jubilee Witch Hazel (18940)	N. H. Enders
Maxon Count's Ranunculus (58352)	428	29.11.34	3	1	422	6,138	375	Maxon Count Graceful (6754)	Springhurst Ranunculus 2nd (18937)	G. A. McNabb and Son
Bonnay Amanda's Doris (51865) ..	427	19.9.33	3	2	402	7,309	359	Jersey Inn Edith's Masterpiece (9082)	Bonnay Lady's Amanda (38975)	E. J. Vagg
Olivedale Buttercup (37381) ..	426	3.6.29	3	3	395	6,290	368	Studleigh Dandy (5435) ..	Olivedale Creamy (18467)	W. H. Lyon
Rylands Vanilla Slice (64161) ..	425	25.5.35	3	1	446	6,555	376	Orphanage Zafferine's Prince (10985)	Peri Vanilla (18914) ..	J. H. Phillips
Sylvan Hill Countess (38278) ..	425	20.7.29	2	5	443	7,342	385	Somerville Heir Apparent (5460)	Duchess 4th of Goulburn (11711)	Smith Bros.
Grangelea Rosella (33042) ..	424	29.8.29	3	1	418	6,610	372	Banyule Airo (5751) ..	Grangelea Rosebud 4th (26393)	Mrs. A. A. Broad
Sylvan Hill Charm (46300) ..	424	22.7.31	3	5	432	7,493	379	Somerville Heir Apparent (5460)	Sylvan Hill Attractive (33760)	Smith Bros.
Milvue Tiny Rosebud (58469) ..	423	15.11.35	4	..	356	6,619	345	Milvue Bettwys Master (12955)	Milvue Roseleaf (45181) ..	E. Hore
Belgonia Gem's Noella (42922) ..	422	16.8.32	3	2	552	9,256	461	Duke of the Lake (Imp.) (7805)	Gem's Noella (Imp.) (33497)	P. J. Maloney
Sylvan Hill Handsome Bell (64407)	422	2.10.35	4	..	449	5,397	347	Glen Iris Bowbells (8052)	Sylvan Hill Handsome Girl (33762)	Smith Bros.
Wattle Vale Modesty (21203) ..	420	10.4.25	4	2	480	6,666	356	Duke of Melrose (2971) ..	Wattle Vale Pride (9272)	D. E. Cook
Jubilee Rowan (38128)	420	18.1.30	3	3	405	7,084	357	Jubilee Whatlight (4861)	Jubilee Rhododendron (19946)	M. A. Nicholas
Rosyth Gay Grevillea (55120) ..	418	31.7.33	3	2	489	7,128	372	Werribee Gaypiece (4823)	Rosyth Grevillea (46068)	Mrs. N. B. Alston and Sons
Bonnay Phyllis (38978)	417	25.7.30	3	4	449	6,881	370	Welbourne Handsome Boy (5573)	Queensvale Phyllis (19964)	E. J. Vagg
Vaucluse Princess (55699) ..	416	18.9.34	4	..	429	6,038	343	Paisley Master (12009) ..	Vaucluse Empress 3rd (51013)	Fairchild and Clutterbuck
Normandie Mayflower 6th (45473)	415	24.8.32	3	3	457	7,519	378	Normandie Majestic (7705)	Normandie Mayflower 4th (33194)	L. W. R. Colenso
Normandie Ilma (25329) ..	415	15.6.27	2	4	479	8,088	411	Thelma's King of St. Albans (4115)	Hazelbrook Ilma (18665)	L. W. R. Colenso
Maxon Count's Lodestone 2nd (54020)	413	25.8.34	3	2	522	6,546	379	Maxon Count Graceful (6754)	Lodestone of Springhurst (21608)	G. A. McNabb and Son
Maxon Mercedes Ranunculus (45067)	412	27.9.32	4	3	394	5,728	340	Maxon Mercedes Chief 4th (8063)	Ranunculus 2nd of Springhurst (18937)	G. A. McNabb and Son
Normandie Golden Nancy (49868)	412	7.3.33	3	2	396	6,243	366	Normandie Golden Peer (9860)	Nancy 4th of Somerset (17401)	L. W. R. Colenso
Noorat Air Lady (36909) ..	412	13.10.30	3	2	402	6,595	368	Air Lord of Banyule (3337)	Noorat Gazelle (25268) ..	Miss G. Black
Glen Iris Golden Design (52816) ..	411	6.9.35	3	1	442	6,964	363	Design's Golden Oxford (Imp.) (11280)	Glen Iris Design's Finesse (43966)	C. S. Walker
Maxon Count's Alsyke 4th (58348)	409	21.8.35	3	1	427	5,552	344	Maxon Count Graceful (6754)	Maxon Bright Alsyke (37846)	G. A. McNabb and Son
Jubilee Myrtle (33665)	409	25.5.28	2	5	421	6,896	360	Jubilee Whatlight (4861)	Jubilee Marigold (23391)	M. A. Nicholas
Elmwood Merry Lark (57189) ..	408	9.2.33	2	3	416	6,787	381	Austral Valley Lord Larkspur (8832)	Elmwood Merry Girl (37572)	J. J. Coulthard
Grangelea Rosebud 3rd (18651) ..	408	17.8.24	1	5	426	8,128	390	Golden Twylish (1017) ..	Grangelea Rosebud 2nd (14132)	Mrs. A. A. Broad
Jubilee Ricious (38344)	407	12.9.30	4	3	388	6,198	330	Jubilee Wheatenlight (6133)	Jubilee Roseleaf (33668)	M. A. Nicholas
Normandie Hawthorn 4th (45471)	406	17.9.32	3	2	383	5,981	323	Peer of Lewisham (4483)	Belmont Hawthorn 2nd (18667)	L. W. R. Colenso
Maxon Count's Ranunculus 2nd (58353)	406	28.8.35	4	..	436	5,322	348	Maxon Count Graceful (6754)	Maxon Mercedes Ranunculus (45067)	G. A. McNabb and Son
Fourshells Yvette (38349) ..	406	29.6.30	2	5	490	7,526	405	Belgonia Propeller (5776)	Boveagh Yvette (29512)	J. O'Neill
Pine Park Lady's Choice 2nd (41580)	404	1.12.30	3	4	383	5,196	291	Goronga Farm Jester (6087)	Pine Park Lady's Choice (25438)	A. O. Foster
Maxon Graceful Duchess 2nd (49427)	404	6.6.33	3	3	478	5,948	375	Maxon Count Graceful (6754)	Graceful Duchess 25th of Melrose (11778)	G. A. McNabb and Son
Sylvan Hill Buttercup (46299) ..	403	30.7.31	2	5	423	6,544	378	Somerville Heir Apparent (5460)	Sylvan Hill Daisy (21669)	Smith Bros.
Inverbroom Molly's Bunty (57762)	403	3.5.35	3	1	408	6,848	355	Grangelea Butter Boy 3rd (10653)	Inverbroom Silver Molly 40289)	W. J. Wade

Advanced Register of Merit for Standard Herd Test. (273 Day Period of Test)—*continued.*

Name of Cow with Herd Book No.	Production Attainment (Average of Four Best Consecutive Yields).	Details to Date of Life Time. (No age allowances.)						Details of Breeding.		Name of Owner.
		Date of Birth.	No. of Test Records.		Highest Individual Record.	Average Yield over all Lactations.		Name and H.B. No. of Sire.	Name and H.B. No. of Dam.	
	B.-fat (lb.).		Under 5 yrs.	Over 5 yrs.	Fat (lb.).	Milk (lb.).	B.-fat (lb.).			
***Jerseys*—continued.**										
Grangelea Rose 5th (48525) ..	402	7.10.33	3	2	366	7,222	332	Banyule Macon (6174) ..	Grangelea Roseleaf 2nd (26394)	C. S. Walker
Brookfield Rosalind 22nd (47445)	401	26.8.32	2	3	429	6,752	384	Brookfield Ewell (5141) ..	Brookfield Rosalind 5th (15589)	J. J. Coulthard
Walambra Lady (64779) ..	401	21.7.34	4	1	422	5,537	321	Banyule Airo (5751) ..	Jubilee Laconia (44531) ..	J. J. Coulthard
Clarendon Eyre Camille 11th (56799)	401	6.12.34	3	1	477	6,705	350	Victorious Pioneer (Imp.) (7964)	Clarendon Eyre Camille 5th (43379)	J. Moore and Co.
Sylvan Hill Beauty 2nd (64403) ..	401	13.10.35	4	..	365	5,628	334	Glen Iris Bowbells (8052)	Sylvan Hill Beauty (38277)	Smith Bros.
RED POLLS.										
Victoria Volt (4049B)	514	24.7.31	3	4	537	10,006	445	Victoria Vice Captain (1267A)	Victoria Eructation (3226C)	State Research Farm
Victoria Maid Marion (5690AA) ..	462	25.6.34	3	1	445	8,977	406	Woodburn Peter Pan (1504AA)	Victoria Village Belle (1522AA)	State Research Farm
Maryville Eve (2506C)	448	27.9.28	3	6	525	9,136	425	Victoria King Bird (940A)	Scotia (525D)	F. T. Butcher
Maryville Elva (3722A)	446	17.2.33	4	2	437	7,921	356	Victoria King Bird (940A)	Maryville Ena (3135B) ..	F. T. Butcher
Maryville Jean (6206D)	414	20.10.35	4	..	386	8,092	341	Chandpara Ferdinand (1779AA)	Maryville Alice ( ) ..	F. T. Butcher
Maryville Ella (5898A)	413	30.11.35	4	..	444	7,877	340	Chandpara Ferdinand (1779AA)	Maryville Etta (5049) ..	F. T. Butcher
Victoria Eructation (3226C) ..	405	19.3.29	4	4	395	8,057	357	Victoria Volcano (322A) ..	Victoria Cutty (490D) ..	State Research Farm

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The Journal of the DEPARTMENT of AGRICULTURE of VICTORIA

WHEY AS A STOCK FOOD

By A. C. T. Hewitt, M.Agr.Sc., Live Stock Science Officer.

Where whole milk is sold for cheese manufacture instead of cream for butter, the usual number of calves can still be economically reared on fresh whey received from the cheese factory. With regard to pigs, however, unless the piggery is large or situated close to the cheese factory, or unless the whey is delivered at less than ¼d. per gallon, it is not considered economic for farmers to continue in pigs when whole milk is sold. Whey can be turned into profit at piggeries run in conjunction with cheese factories where it is hygienically looked after and pumped direct to the piggery

THE disposal of whey is a problem confronting many factories now that a change from butter to cheese manufacture is contemplated. Whey becomes very obnoxious when not properly disposed of, and where it cannot be dried or manufactured into lactose, it should be fed to live stock, preferably pigs and calves. Whey does not lend itself to easy treatment in septic tanks or filter systems, but surpluses which cannot be fed to pigs and calves can be got rid of by lightly sprinkling over pasture and crop paddocks. Whey contains approximately 6·4 per cent. of dry matter, and 93·6 per cent. of water. Most of the dry matter is milk sugar, 5·0 per cent.. and the remainder is protein (mostly lact-albumen) ·7 per cent. and ash ·7 per cent. These materials are excellent stock foods, and, therefore, attempts should be made to feed every drop of surplus whey to stock, principally pigs and calves.

Some factories dry the whey, but as 2½ times more water has to be evaporated to produce 1 ton of dried whey than to produce 1 ton of dried milk, it is a costly process, and too costly for general stock feeding purposes. Other factories are making milk sugar (lactose) from whey. Both of these processes require expensive machinery, and would not be practical except at very large factories, while the demand for both products is limited.

Kinds of Whey.

In most publications, the whey referred to is whole cheese whey, and contains from ·2 per cent. to ·35 per cent. of butter-fat. In practice, this whey is separated before being fed to stock or otherwise treated. In addition to whole and separated cheese wheys there are at least three types of casein whey available, as follow:—(1) rennet casein whey, obtained when the curd is precipitated with rennet, (2) mineral acid casein whey, obtained when acids such as muriatic or hydrochloric acid are used to precipitate the curd, and (3). lactic acid casein whey, obtained by the use of lactic acid generated from the milk sugar. Except where casein is made from butter milk, all casein is made from separated milk, and the whey contains practically no butter-fat. The food values of rennet and mineral acid casein wheys are very nearly equal to that of separated cheese whey, but lactic acid casein whey has a low food value.

In producing lactic acid, much of the principal food material, lactose, is broken down and the lactic acid may cause digestive disorders. Very sour cheese whey is similar to lactic acid casein whey, and for this reason all whey should be fed as soon as possible. Although the ill-effects of the high acidity can be counteracted to some extent by neutralizing

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with sodium bicarbonate or calcium carbonate, the food value due to the breaking down of the lactose is permanently reduced.

The Food Value of Whey.

The analyses of cheese wheys are as follow:—

	Whole Cheese Whey. Per cent.	Separated Cheese Whey. Per cent
Water	93·4 ..	93·6
Carbohydrate (sugar)	5·0 ..	5·0
Protein	·7 ..	·7
Minerals	·7 ..	·7
Fat	·2 ..	-
Fibre	— ..	—

Practically the whole of these ingredients is digestible. For comparison, the nutrients in some of the more common pig foods are shown below:—

Foodstuff.	Dry Matter	Starch Equivalent	Protein Equivalent
	%	%	%
Whole cheese whey ..	6·6	6·0	·6
Separated cheese whey..	6·4	5·5	·6
Dried whey	97·5	9·0	11·4
Separated milk ..	9·6	8·0	3·6
Pasture, short, succulent	20·0	14·0	4·5
Pasture, green, flowering	25·0	14·0	2·2
Pollard	89·5	69·0	10·6
Barley	87·0	71·0	6·8
Wheat	88·5	72·0	8·0
Meat meal (60 per cent. crude protein) ..	90·5	84·0	54·5

Whey contains less nutrients and much more water than does skim milk or pasture, and, for an animal to subsist on whey alone, a large volume has to be drunk. It is not possible for sows to rear good litters, or for weaners to grow normally, or for porkers and baconers to top off properly on whey without some solid food, although dry sows and large stores do well on it when it is properly fed to them. A dry sow will drink up to 18 gallons daily, but to drink this amount, she must be fed early in the morning, late at night, and several times during the day.

The Monetary Value of Whey.

It is difficult to arrive at the monetary value of whey, because it is bulky and perishable. From the pig feeders' point of view, and, in comparison with the present prices of pigs and general foodstuffs, it is worth about ¼d. per gallon on the farm as a pig food. However, it may be worth ½d. per gallon to a few farmers who have a cheap source of dry food to go with it, or particularly good pigs that it is desired to keep and yet supply whole milk to the factory. At ¼d. per gallon on the farm, whey is definitely not worth carting any distance in small quantities, even though it be obtained free at the factory. Therefore, unless supplied in large tank loads at low cost, or by a pipe line, it will not pay farmers to continue in pigs and supply whole milk at the same time. As a food for calves, fresh undiluted cheese whey is more valuable, being worth fully ½d. per gallon on the farm.

The question now arises as to what margin in price is necessary before it will pay a farmer to change from the sale of cream and pigs to the sale of whole milk. This margin will vary considerably with the conditions on each farm, but, where pigs are moderately well established, a margin of 2½d. per lb. of butter-fat in whole milk above butter-fat in cream is necessary before it will pay the farmer to sell his pigs, more or less scrap his piggeries, and change to the selling of whole milk. Once having changed over to the sale of whole milk, it is not so easy to change back to pigs, because the piggeries will have to be put in order, or perhaps rebuilt, and new pigs purchased. Therefore, the margin in price could fall to below 1d. per lb. before it would pay to revert to pigs and cream. The present contract price with Great Britain for cheese is such that all cheese factories could now pay at least 2½d. per lb. more for butter-fat in whole milk than for butter-fat in cream.

Tuberculosis.

To prevent the spread of diseases, such as tuberculosis, factories must heat all whey to a temperature of at least 160 deg. F. before releasing it to farms as a stock food (Regulations, Stock Diseases Act). Unfortunately, this heating is usually done by turning live steam directly into the whey, and thus diluting the whey by fully 10 per cent. with condensed steam (water). It would be much better from the feeders' point of view if the whey were heated by the usual pasteurizing methods.

The dilution of whey with wash water should be avoided. This is a circumstance that the pig feeder often has to contend with, and adds to the reasons why dairy farmers, even those adjacent to the factories, do not keep pigs and feed whey.

Whey Supplies.

The seasonal variation in the output of whey from a factory makes it difficult to economically feed all the surplus whey in the flush season of the year.

For every ton of cheese made, 10 tons of whole milk are required, leaving 9 tons of whey. Therefore, if 20,000 tons of cheese will be made in Victoria during the next twelve months, 180,000 tons of whey will be produced, but this whey will not be available at the rate of 500 tons per day throughout the year. Due to seasonal conditions, more than 1,000 tons will be available daily during October, November, and December, and less than 200 tons daily during March, April, and May, with intermediate quantities during the other months. This tremendous seasonal variation adds difficulties to maintaining a piggery for consuming the whey without wasting some whey in the flush season and buying large quantities of supplementary feed in the lean season.

Corrosive Effects of Whey.

The lactic acid in whey is particularly destructive to cement, and soon destroys concrete tanks, troughs, and floors. Ordinary galvanized iron tanks are very suitable for storing whey, and iron or wooden feeding troughs are quite satisfactory. Whey splashing on concrete floors and drains destroys them. Therefore, the whey troughs should be placed in paddocks or dirt yards, or on movable wooden platforms. The sties where pigs are being topped off on whey and other foods may be built 2 or 3 feet above ground with wooden grate-like floors, similar to those used in sheep sheds. Movable wooden shelters similar to those illustrated in the pamphlet "Pig Housing and Equipment," by L. A. Downey, H.D.A., the Department's Pig Expert, would be very suitable on the piggery where whey is fed. This pamphlet will be supplied free of cost on application to the Department of Agriculture, Melbourne, C.2.

A galvanized iron pipe line resists corrosion fairly well, and is most convenient for pumping the whey from the factory to the piggeries. Barrel unions or rubber sleeve joins should be inserted every couple of chains to facilitate dismantling and cleaning in the case of a blockage. It is not advisable to pump butter milk, skim milk, or condemned milk through the whey pipe line, as the casein is apt to cause blockages. As a precaution towards keeping the pipe line clear, the wash water is usually pumped through after the whey. Water, not whey, is then left lying in the pipes. The manager of the piggery should be advised when wash water is being pumped, so that he can divert it from running into the whey tanks and troughs.

Under the Milk and Dairy Supervision Act the use of milk cans for the carting and storage of whey is not permitted. Whey soon destroys the tinning and rusts the cans.

Feeding Whey to Pigs.

The two principal points to remember when feeding whey to pigs are—(1) that whey is deficient in iron, and, to prevent anaemia, all breeding stock and young pigs, particularly newly farrowed sows and their litters, should be grazed or otherwise have access to soil to supply iron; and (2) that sudden changes in the rations must be avoided, since whey contains a very small quantity of highly concentrated dry matter, and a tremendous amount of water. Pigs accustomed to large quantities of whey develop large ravenous appetites, and the small intestines become adapted to handling the small quantity of concentrated dry matter. If these pigs are suddenly changed to solid foods they eat them readily, but severe digestive disorders often set in, with much straining and many ruptures.

In the pamphlet "Pig Feeding," by L. A. Downey, H.D.A. (obtainable free of cost on application to the Department of Agriculture,

Breeding stock fed on whey should have access to pasture.

Movable wooden platform and trough for pig feeding.

Melbourne, C.2), the subject of pig feeding is dealt with, but here the subject of feeding whey to pigs is discussed more from the aspect of the most economical means of whey disposal than from the best method of pig feeding. Generally, whey is best fed at piggeries run specially for the purpose, and not at small individual farms. Many successful piggeries are being run in conjunction with cheese factories in Victoria.

The site selected for the piggery should be about 1 mile from the factory, and, if possible, on rising sandy ground. At this distance flies are not likely to travel backwards and forwards between the piggery and the factory. Sandy ground is preferable for many reasons, and it will absorb the wash water and surplus whey from the factory and urine from the pigs.

The Girgarre Cheese Factory piggery, maintained for disposing of surplus whey.

Sufficient whey should be available from a factory producing 1,500 tons of cheese annually to maintain a herd of at least 200 brood sows, rear all the young pigs, and fatten them as baconers. About 3,000 baconers should be sold annually. In addition to the whey, about 300 tons of fattening foods, such as pollard or ground grain, 40 tons of meat meal, and at least 20 acres of pasture would have to be provided.

In addition to whey, suckling sows should be fed at least 2 lb. of pollard or ground grain, and ½ lb. of meat meal each per day; all weaners and growing pigs 1 lb. of a mixture of 10 parts of pollard or ground grain, and 1 part of meat meal, and, for topping off, the baconers should be given 2 or 3 lb. of pollard or ground grain each daily. Dry sows and store pigs can be maintained on whey and pasture only. When whey supplies are short, more meals will be required, and all pigs will have to be given a supplementary ration.

In the flush season it is not always possible to feed all the whey, and in such cases the surplus should be run into sandy ground or sprayed over pastures.

To do well on whey, pigs must drink very large quantities, and to do this they must be fed several times during the day, with the first feed early in the morning.

The following feeding times are recommended:—5.30 a.m., 8.30 a.m., noon, 3.30 p.m., and 5.30 p.m.. Whey should be

given at all feeds, but the meal is best given in two feeds; half the daily allowance at 8.30 a.m., and the other half at 3.30 p.m. In the winter time the feeding times should be altered so that feeding is done in daylight and, as whey supplies will be scarce, it may be necessary to feed meals more often. Four, or perhaps only three feeds daily will be necessary when there is only a small quantity of whey to force through the pigs.

Whey for Calves.

Large quantities of whey can be used for rearing calves, which do well on it. The idea that calves cannot be reared on farms when whole milk is sold is wrong, as there are many substitute foods, including whey.

All calves should be fed on whole milk for at least two weeks, and during the next three weeks the new milk can be gradually reduced and replaced by whey.

For best results it is desirable to mix ¼ lb. of meal, such as linseed meal, or a mixture of linseed meal and pollard, with each gallon of whey fed, but whey only can be used, and by the sixth week the calves will do well on whey as the only bucket feed.

The quantities of whole milk and whey to feed to calves of varying ages are shown in the following table.

Age of Calf.	Quantity of Whole Milk. lb.	Quantity of Whey. lb.
1st week ..	up to 12 ..	—
2nd week ..	12 ..	—
3rd week ..	9 ..	5 to 10
4th week ..	6 ..	10 to 15
5th week ..	3 ..	15 to 20
6th to 24th week	— ..	20 to 30

The above quantities should be fed daily in at least two feeds, half in the morning and half in the evening. Both the whole milk and the whey should be fed warm, at a temperature of 90 deg. F. It is essential that sweet, fresh, undiluted whey be used for calf feeding. Calves do ever so much better on whole cheese than on separated whey. Calves being reared on whey should be grazed on good pasture, supplemented when necessary with good quality hay. When abundant supplies of whey are available, and in warm weather, older calves may drink much more whey than the quantities shown above.

Farmers rearing 20 calves will require up to 60 gallons of fresh whey daily. Such farmers should insist on being supplied with fresh undiluted whey. For calves, whey is better obtained direct from the factory daily in individual, sterilized cans or drums, rather than from a pipe line or a bulk tank delivery.

Methods of rearing calves are fully outlined in the pamphlet "Dairy Calves," which is obtainable free of cost on application to the Department of Agriculture, Melbourne, C.2.

Individual feeding is preferable to trough feeding, although the latter is frequently used.

Pasture Plants of Victoria

3.—Weeping Grass (*Microlaena stipoides*)
Scented Vernal Grass (*Anthoxanthum odoratum*)
Veldt Grasses (*Ehrharta longiflora, erecta and calycina*)

By W. D. ANDREW, M.Agr.Sc., Assistant Agrostologist.

This is the third of a series of articles presented in simple form to enable members of Young Farmers' Clubs and others to obtain an elementary knowledge of the pasture plants of Victoria. Previous articles appeared in this Journal in February and June, and dealt with the rye and canary grasses. Explanations of the botanical terms used will be found in the glossary at the conclusion of this article. For descriptive illustrations of botanical terms, readers should refer to the previous articles.

A GROUP of plants very closely related botanically is known as a "genus," while one made up of several allied genera is spoken of as a "tribe." The grasses which occur in Victoria are divided into nine tribes.

The three genera listed above, viz.:—Microlaena, Anthoxanthum, and Ehrharta, together with the genus Phalaris already described, and two others of little or no agricultural importance, constitute the tribe Phalarideae.

All species belonging to this tribe have a much branched inflorescence (panicle), but in some the arms of the panicle are very short and it has the appearance of a spike.

The spikelets or parts which make up the inflorescence consist of a single fertile floret—containing an ovary, stamens, palea (inner flowering glume) and lemma (outer flowering glume)—surrounded by four glumes. The lower pair of these are the outer glumes, the second pair are actually sterile florets each consisting of an empty lemma or a lemma containing stamens but no ovary. See figure 2. At maturity the rachilla (axis of the spikelet) fractures just above the outer glumes, and the "seed," consisting of the fertile floret encased by the two sterile lemmas, falls and leaves the outer glumes attached to the stalk of the spikelet.

Although closely related botanically, these grasses have distinctive agricultural characters. With the exception of *Ehrharta calycina,* which is a comparatively recent introduction, all are widespread in the better rainfall areas in the southern part of this State. The two most common are Weeping grass and Scented vernal grass. The former provides useful pasturage for sheep, and is held in high esteem by some graziers, but vernal grass is of limited value, notwithstanding its pleasant aroma. *Ehrharta longiflora* and *E. erecta* are commonly found growing in protected places, but usually do not occur in grazing paddocks.

Weeping Grass (*Microlaena stipoides, R. Br.*).

The genus *Microlaena* is native to Australasia. Five species are recorded for Australia and six for New Zealand.

Weeping grass is most common in the southern districts of Victoria, but is found also at considerable distances from the coast in the medium to low rainfall areas. Under dry conditions its fodder value compares very favorably with other native perennial grasses. It provides palatable sheep feed, and is reported to be a good fattening grass. Weeping grass has a strong root system which enables it to withstand periods of low rainfall without injury, and it makes fresh growth throughout the year when soil moisture is available. In some respects it has the habit of *Phalaris tuberosa,* but is much inferior as a pasture grass.

It spreads mainly from seed, but also gradually extends by means of short rhizomes, forming patches of fairly close turf. The herbage produced is short and leafy and, although quite nutritious, is rather meagre in comparison with the amounts produced by some of the introduced pasture species under similar conditions.

Identification.—In the vegetative condition *Microlaena stipoides* is not a conspicuous grass as the herbage grows fairly close to the ground. The leaves are borne on short stems which rise from a tough rhizome. They are dull on both faces, 1 to 2 inches long, and up to a quarter of an inch in width. In general appearance the foliage is not hairy, but if a leaf is bent over the finger and viewed against a light background four distinct main lines of short hairs can be seen along the leaf blade. The veining on the upper surface is fine and not conspicuous, but on the underside there is a prominent light-green mid-rib and four distinct veins, corresponding in position to the lines of hairs on the other side. The edge of the leaf is lighter in colour than the rest. At the junction of the leaf blade and sheath, there are short blunt auricles which bear a few scattered long hairs along their margins.

Fig. 1.—Weeping grass, so-named because of the pendent habit of the inflorescence.
[After *Grasses of Hawaii*.

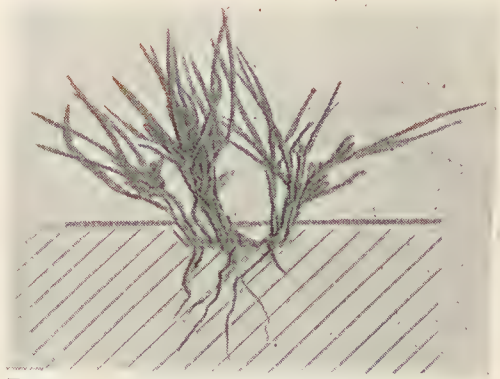


Fig. 3.—Weeping grass showing foliage and creeping root system.

Flowering heads appear about November, and grow to a height of 1 to 2 feet. The panicle, which is 3 to 6 inches long, assumes a slightly pendent habit, with the spikelets hanging down from the axis is a manner suggestive of a weeping attitude.

Spikelets are borne on branches of varying length, grouped at intervals along the rachis. The outer glumes

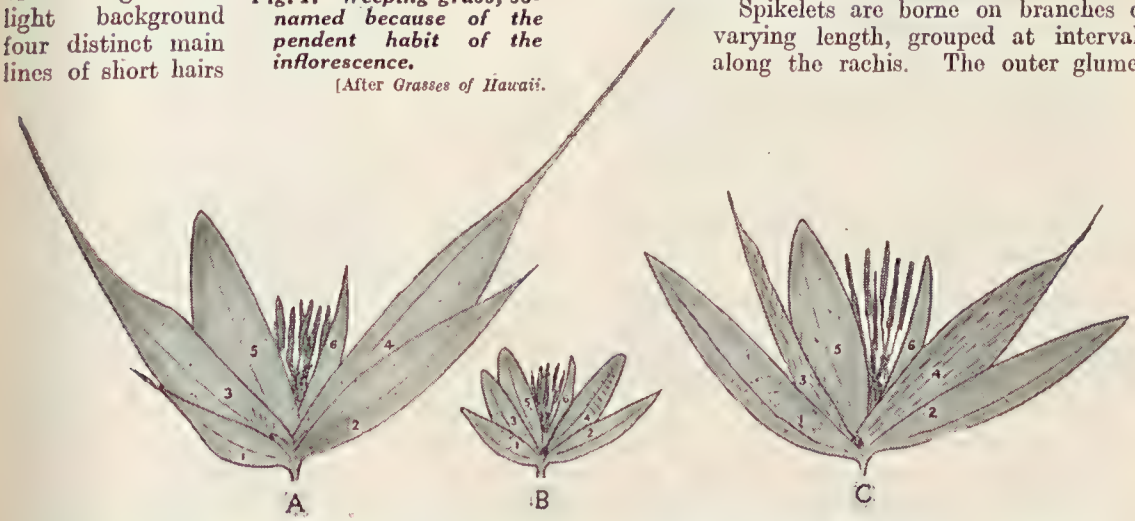


Fig. 2.—Spikelets of (a) Ehrharta longiflora; (b) E. erecta; (c) E. calycina. 1.—First outer glume; 2.—Second outer glume; 3.—First sterile lemma; 4.—Second sterile lemma; 5.—Fertile lemma; 6.—Palea. Note relative sizes and shapes of various glumes, the pitting at base of sterile lemmas in E. longiflora and auricles in spikelets of E. erecta and E. calycina on second sterile lemma.

in the spikelets are small and unequal, but the sterile lemmas are ¼ inch to ⅜ inch long, and taper off to a fine awn of about ⅝ inch. These lemmas have prominent longitudinal ribbing and transverse wrinkles, which become more marked toward the tip. The flowering glumes are awnless and have a shiny surface, and there are four stamens.

At the base of the "seed," there is a conspicuous tuft of short white hairs. The grain of Weeping grass is small and narrow, and yellow in colour.

Fig. 4.—Complete spikelet of scented vernal grass and component parts. Note sterile lemmas hairy and awned.

[After *U.S. Dept. Agric.*

Scented Vernal Grass (Anthoxanthum odoratum, L.).

Scented vernal grass, an introduced perennial, is indigenous to Europe and Asia, and to many parts of Northern Africa. It came into Victoria at some time before 1887, and is now very common in districts of moderate to high rainfall. It will grow within a wide range of soil types, and, although fairly tolerant of extremes of temperature and moisture, is most suited to cool moist conditions, such as one finds in the central highlands, the southern Western District, and in Gippsland.

Where soil fertility is depleted by constant mowing for hay, or faulty grazing management, vernal grass often becomes prominent, replacing species which require better conditions. During the early part of the year this grass is rather inconspicuous, as the herbage is sparse, but when the seeding heads appear in the spring it can be readily detected.

Scented vernal grass is so named because it contains a substance (cumarin) which has a pleasant aroma particularly noticeable at flowering time. Other plants, however, besides vernal grass contain cumarin.

In the early days of pasture development vernal grass was sometimes sown in pasture mixtures to impart a fragrance to the meadow hay, but the practice has been discontinued.

Stock avoid vernal grass as its herbage, both in the fresh and dried condition, is bitter, and its presence in the pasture is undesirable on that account. It can be kept in subjection by maintaining soil fertility at a high level.

Identification.—Scented vernal grass is an upright shallow-rooted perennial grass which forms small tufts and grows to a height of 12 to 18 inches. The leaves are sparsely hairy or glabrous, 1 to 3 inches long, and about ¼ inch wide. They are widest about the middle and taper off to a point rather abruptly. Young leaves are rolled in the shoot.

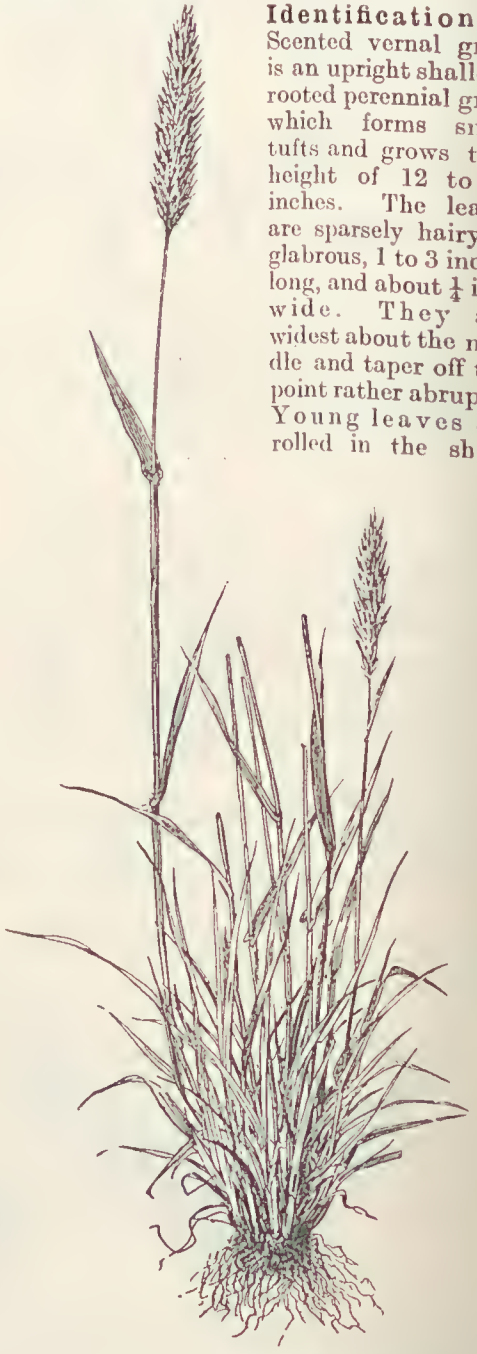


Fig. 5.—Scented vernal grass.

[After *U.S. Dept. Agric.*

The leaf sheath is split, has a slight keel, and is generally glabrous, although sometimes sparsely hairy on the upper part. Usually no leaf auricles are present, but there are collar-like ledges which are sparsely hairy along their margins. A conspicuous short blunt ligule is present.

The first outer glume of the spikelet is about 3/16ths of an inch long, and is transparent, with a conspicuous brown mid-rib. The second is about twice as long and wraps around the two sterile lemmas and the floret. It is of a thin papery texture, and has three prominent nerves. Both sterile lemmas are brown and hairy, one bears a short awn from about its middle, the other has a long bent awn which arises near its base. About half the length of this long awn protrudes from the top of the spikelet. The palea and the lemma of the fertile floret are brown and shiny, and split at the tip.

Commercial seed of sweet vernal grass comes mostly from Holland, and is rather high in price, as it is collected by hand. A pound contains about 800,000 seeds.

Annual Veldt Grass (Ehrharta longiflora, Sw.).

Annual veldt grass is a native of South Africa, and is now quite common in the southern districts of Victoria. One frequently sees this vigorous annual species luxuriating in waste places and, although it makes strong growth when protected, it does not appear to be capable of persisting under grazing, and is not cultivated as a pasture plant in Victoria.

Identification.—The plants assume an open, somewhat sprawling, habit, with the stems growing outward from the crown before becoming upright. The foliage is coarse and stemmy, and stems grow to a height of about 1 ft. 6 in. in well-developed specimens.

The leaves of annual veldt grass are bright green in colour, glabrous, and up to ½ inch broad and 9 inches long, with a crinkled margin often tinged with purple. They have a prominent mid-rib on the under side, but the veining is indistinct on the upper surface. The leaf sheath is oval, and has a keel which is the continuation of the mid-rib of the leaf. Auricles on the leaves are very prominent in this grass, being white when young and turning purple as the plant ages. A few scattered hairs occur along their margins. The ligule is mostly white, about ⅛ inch long, and terminates in a fringe.

Plants flower in the autumn and in the spring, and odd ones produce heads throughout the year. The panicle is very conspicuous, and somewhat resembles the inflorescence of the oat plant. It ripens from the top downwards. Spikelets are attached to short branches which are borne in groups at intervals along the rachis in a manner similar to weeping grass, but they are much larger, and their outer glumes change from green to purple as they mature. After the "seed" has fallen the colour fades from purple to a light blue. Outer glumes are unequal in size, and have sharp pointed tips.

Fig. 6.—Annual veldt grass. Note coarse, stemmy herbage, and oat-like inflorescence.

The sterile lemmas are tough and shiny, and terminate in short stiff awns. They are pitted and have short tufts of hair near the base. The fertile lemma is shorter than the sterile lemmas and has no awn, and the palea is narrow, slightly keeled and papery in texture. Annual veldt grass florets have four to six stamens, more commonly the latter.

Panic Veldt Grass (Ehrharta erecta, Lam.).

Panic veldt grass, a short-lived perennial grass, is a native of Africa, and was recorded as naturalized in Victoria in 1910. Although

widespread in the southern districts, it has not become prominent in pastures and is found mainly in damp shady sheltered places.

In recent years this grass has come under notice as a pasture species likely to be of value for medium to low rainfall areas in Australia. A trial near Canberra indicated that it is fairly drought resistant, but plants from seed sown at Walpeup, in Victoria, did not persist or re-establish from seed.

In common with other species of *Ehrharta,* this grass seeds freely, but the germinative capacity of the seed is often poor. Although germination is best obtained in a warm seed bed, seed strikes readily under moist relatively cool conditions, such as prevail in the Melbourne district.

An analysis of the herbage indicates a rather low protein content, as one might expect from the tough nature of the foliage; nevertheless, sheep appear to find it palatable.

Identification.—Panic veldt grass forms dense clumps 4 to 6 inches high without the inflorescence. Its fibrous root system does not penetrate very deeply into the soil, so that plants growing in loose ground can be pulled out fairly easily.

Under Victorian conditions, when grown in sheltered places, this grass remains fresh and green throughout the year, and flowers mainly in the autumn and the spring. It is less conspicuous than *E. longiflora,* but gives the impression of being a better pasture grass, as the stems are finer and the plants are more leafy. The leaves are about 3 inches long and $\frac{3}{8}$ inch wide, similar in shape and veining to annual veldt grass, but seldom have a purple colouration along the crinkled edge. The ligule is up to $\frac{1}{8}$ inch long, usually white, but sometimes tinged with purple, and it has a fringed tip. Leaf auricles are blunt, have scattered hairs along their margins, and become deep purple at maturity.

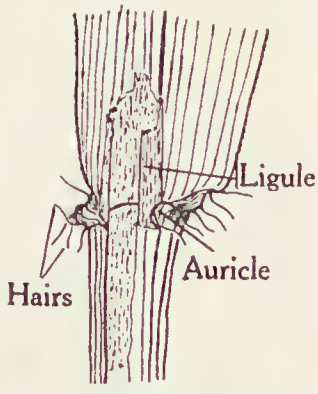


Fig. 7.—The diagram illustrates the ligule and auricle of panic veldt grass.
[After *C.S.I.R. ph.* 63.

The inflorescence is unlike any of the other Victorian species of this tribe. It consists of a narrow sparse panicle of small unawned spikelets. These are attached to the branches of the rachis by pedicels of various lengths—often two are borne at the same point, one on a short and the other on a longer pedicel.

Panic veldt grass. Note sparse inflorescence and dense leafy herbage.

Although the spikelets are smaller than those of the other species of *Ehrharta,* they are similar in structure. Distinguishing features are the transverse wrinkling and lobed appendages (auricles) on the second sterile lemma, and the absence of hairs on the glumes in the spikelet.

Perennial Veldt Grass (Ehrharta calycina, Sm.).

Perennial veldt grass is an introduced species. It did not attract much attention in Victoria until Mr. F. W. Hayes, of Dimboola, obtained some plants from South Australia, and found that it was suitable for poor sandy country in the Dimboola district. It was planted about 1929, in a nursery bed on his farm, and now occupies small areas in this locality.

More recently this grass was placed under trial at the Mallee Research Station, at Walpeup, and results to date have indicated that it is the best of a number of perennial grasses tried there, and shows promise under Mallee conditions.

In the better rainfall areas it spreads fairly rapidly on sandy soils by re-seeding, and in drier country seedling growth is usually found in close proximity to the older plants.

On the desert country at Dimboola, Mr. Hayes propagates this grass mainly by planting out small portions of a mature plant, but at Walpeup it has been successfully established by sowing seed through the drill, both with or without a cover crop of wheat.

Perennial veldt grass growing under dry conditions at Dimboola.

This species of veldt grass remains green throughout the year, and makes its maximum growth during the spring. It appears to be reasonably palatable, but persistence in the drier areas will no doubt depend on the manner in which it is grazed.

Identification.—Perennial veldt grass forms dense tussocks about 18 inches tall, and produces seed several times during the year. Although the seed usually germinates poorly when freshly harvested, the germinative capacity improves with age, as holding the seed for a period allows an after ripening process to take place.

The vegetative characters of this grass are intermediate between the two species of *Ehrharta* already described, but when in flower it more closely resembles *E. longiflora*. The inflorescence, however, is denser as the flowering heads are more numerous, but the spikelets are about the same size, although they do not have long awns on the glumes as in the annual species. The outer glumes of the spikelet are relatively long; the sterile lemmas are hairy, and the second one has a pair of small auricles at its base.

Auricles occur in the spikelet of *E. erecta*, but not in *E. longiflora*.

GLOSSARY OF BOTANICAL TERMS.

Anther.—That portion of a stamen which contains the pollen.

Auricles.—Lobes, most common at the junction of leaf and leaf sheath.

Awn.—A slender bristle, often the prolongation of a midrib.

Blade.—The expanded portion of the leaf.

Caryopsis.—The grain of a grass in which the seed coat is fused to the wall of the ovary.

Entire.—Without toothing or division.

Flowering glumes or pales.—The glumes which enclose the ovary and stamens. They are known as the lemma and palea respectively.

Floret.—The flower of a grass plant. When complete it consists of two flowering glumes or pales enclosing an ovary and stamens.

Glabrous.—Without hairs.

Hybrid plant.—A plant obtained by the fusion of the pollen of one species with the ovule of another

Inflorescence.—A general term for a group of flowers.

Leaf sheath.—Portion of the leaf which wraps around the stem.

Lemma.—The flowering glume which, with the palea, encloses the ovary and stamens.

Ligule.—The thin structure on the inside of a leaf at the junction of sheath and blade. It is sometimes reduced to a semi-circle of hairs.

Nodes.—The swollen, knotty portions along the length of the stem.

Outer glumes.—The glumes which shield the florets.

Ovary.—The female part of the floret. It contains the immature seed or ovule.

Pale.—This term is used for either of the flowering glumes (Palea or lemma).

Palea.—The flowering glume which is partly encased by the lemma.

Panicle.—A loose flower cluster.

Pedicel.—A flower stalk.

Peduncle.—The general term for the stalk of an inflorescence.

Protogynous.—A term used to indicate that the stigma matures before the pollen of the same flower.

Rachilla.—A secondary axis in the inflorescence of grasses.

Rachis.—The main axis of a spike or raceme.

Rhizome.—An underground creeping stem; "root-stock."

Seed.—After fertilization the ovule in the ovary develops into a seed (caryopsis). In most grasses this remains permanently encased by the flowering glumes or pales.

Spike.—An unbranched inflorescence in which the spikelets are sessile on the rachis.

Spikelet.—A group or a single floret shielded by one or more bracts or "outer glumes."

Stamen.—The part of the flower that bears the pollen. It consists of a pollen sack (anther) on a stalk (filament).

Sterile glume.—A glume which does not contain an ovary.

Sterile spikelet.—A spikelet which does not contain a fertile floret.

Stigma.—The receptive tip of the ovary. Grass florets usually have two stigmas.

Stolon.—A surface-creeping stem which generally roots at the nodes.

Tiller.—A sucker or branch from the bottom of the stem.

PURCHASE OF LAMBS

Weight and Grade Schedule

ON the recommendation of the Australian Meat Board, the Commonwealth Government has decided to make it a condition of their Lamb Purchase Plan that exporters will buy lambs on a weight and grade basis from growers who desire to avail themselves of this method of selling.

Growers who sell in Victoria may market their lambs in this way at the works of the following Meat Exporting Companies :—

Amalgamated Freezing Co. (Vic.) Pty. Ltd.,
Wm. Angliss and Co. (Aust.) Pty. Ltd.,
Thos. Borthwick and Sons (A/sia) Ltd.,
Sims, Cooper Pty. Ltd.,
The Western and Murray Co-operative Bacon and Meat Packing Co.,

and any other self-contained works.

The prices to be paid by these freezing companies at the metropolitan and/or Geelong works will be :—

	Spring Lamb. Per lb. frozen weight delivered at works.	Summer Lamb. Per lb. frozen weight delivered at works.
	d.	*d.*
1st Quality—		
D—23/28 lb. ..	6	5⅜
2—29/36 lb. ..	5½	4⅞
8—37/42 lb. ..	4⅞	4¼
2nd Quality—		
D—23/28 lb. ..	5⅜	4¾
2—29/36 lb. ..	4⅞	4¼
8—37/42 lb. ..	4¼	3⅝
3rd Quality—		
L—23/28 lb. ..	4¾	4¼
O—29/42 lb. ..	4¼	3⅝

The prices at the country works, i.e., Ballarat, Bendigo, and Portland will be ⅛d. less in each case.

It may be necessary at some periods and under certain conditions for producers to give to the companies 21 days' notice of the number of lambs they desire to have treated.

Skins and pelts will be taken over at valuation or returned to the grower and/or his agent at the works.

No consignment of less than one truck will be received.

At the moment, lambs under 23 lb. and over 42 lb. are not included in the Government purchase, therefore they will be rejected for export.

Rejects will be paid for at local selling value less cost of killing, or dealt with as instructed.

Full payment will be made, and particulars of weights and grades will be forwarded not later than seven days after killing.

According to Mr. A. C. Fisken, Chairman of the Australian Meat Board, the prices quoted above are, according to locality of works, 1d. to 1⅛d. per lb. lower than the Government purchase price. This difference covers exporters' treating costs, overhead expenses, costs to f.o.b., some recompense for waiting 28 days for 90 per cent. and 4 months for 10 per cent. of the purchase price, and their profit. Although these charges are greater than in the first year of the war, the prices are considered reasonable in view of the higher operational costs, the restriction on some offals and by-products, and the fall in value of others. Growers are urged to exercise the greatest care in drafting their lambs to ensure as far as possible, that none under 23 lb. or over 42 lb. were sent to the works, as it is most undesirable that, at the peak of the killing season particularly, export killing space should be used for non-exportable lambs.

Finally, growers are requested to take the greatest care in handling their lambs in the yards and into the trucks to save rejections for bruising.

Budding, Grafting, and Methods of Re-working Fruit Trees

By

J. L. PROVAN, B. Agr.Sc., Senior Horticultural Instructor, and F. J. GREATOREX, Orchard Supervisor

Previous instalments of this article appeared in the July, August, and September issues of the Journal

Fig. 42.—Frame working.—Top left, apple tree before poling; top right, the same tree after poling; lower left, grafted; lower right, the same tree six months later.

FRAME-WORKING.

WHEN all, or nearly all, of the branch system of a tree is retained, the re-working process is called *frame-working*. The advantages and disadvantages of this method have been outlined previously (p. 394, August *Journal*). It is particularly suited to vase-shaped, pome fruit trees with numerous long leaders and few sub-leaders. In Victoria, it is used only for well-grown apple and pear trees more than eight years old. Usually, scions about 5 inches long are placed at intervals of from 8 to 10 inches along the length of the limbs. A large supply of scion-wood must be available, because each tree requires from 50 to 200 or more grafts, depending upon the size of the tree and the distance between each graft. The large number

of grafts required makes the time taken for each graft an important consideration. Operators therefore tend to give preference to the type of graft which can be most quickly executed with a reasonable expectation of success. Frequently a tree is frame-worked by the employment of several different types of graft.

A list of the grafts used for frame-working appeared on p. 321 of the July *Journal*. The choice of the actual type or types of graft to be used depends to a large extent upon the habit of growth of, and the previous methods of pruning, the tree (stock). The peg, "L," "V," "⊥," needle and gouge grafts can be used on any part of the stock where the bark is smooth. In addition, where suitable lateral growths occur, the various stub-grafts, which are described later, can be used. It is usual to employ one of the top-working grafts, such as the bark, strap, or cleft graft, on the end of each leader.

For convenience, prior to grafting a tree the scion-wood should be cut up into lengths suitable for the type or types of graft to be done. The less accessible limbs should be grafted and sealed first to avoid the risk of displacement of scions on nearby limbs. It is advisable to commence grafting at the base of the limb and work upward, and usually the operator should work so that he is above the graft and facing the butt of the tree.

Preparation of the Stock—"Poling."

Before frame-working is commenced, some preliminary preparation of the tree (stock) is necessary. Badly-placed, broken, or otherwise unsuitable limbs should be removed completely from the tree. The next step is to "pole" the tree. This should be done just before grafting is to commence (see Fig. 42). The extent of poling depends on the types of graft to be used. If small laterals and side growths arising on the main leaders are well placed, they may be retained for stub-grafting. On the north-west and west sides of the poled leaders, occasional spurs and laterals should be retained to provide protection against sun-scald. In the following year, when the growth from the grafts can provide protection for the leaders, these growths which were left for shade purposes may be stub-grafted. It is advisable also to retain the growths on the top third of the leader until the following season, to encourage sap flow. The leader is then cut back to the last graft, or, alternatively, is cut off a little above the last graft and a strap graft is inserted in the end of the leader.

Peg Graft.

The peg graft derives its name from the appearance of the limbs after grafting. The scions look like rows of pegs stuck into the limbs. It is known also as the "plug" or "chisel" graft (Fig. 43). It is not used to any extent now because it takes longer to do, and for small limbs it is less suitable than other types of grafts. It can be commenced earlier in the season than bark grafts. Two sizes of

Fig. 43.—Peg grafts before and after sealing.

chisel, to suit the thickness of the scion, are required for this graft (see p. 325, July *Journal*).

Preparation of the Stock.

If only peg grafts are used, the stock is completely poled. The chisel is driven into the limb with a mallet to a depth of at least ½ inch at intervals of 8 to 10 inches on alternate sides of the limb, from its base up to a point where it is about 1½ inches in diameter. It is not advisable to use this graft on limbs smaller than this, as breakages frequently occur. The chisel should be held at an angle of 60 to 75 deg. to the limb, sloping towards the tip of the limb.

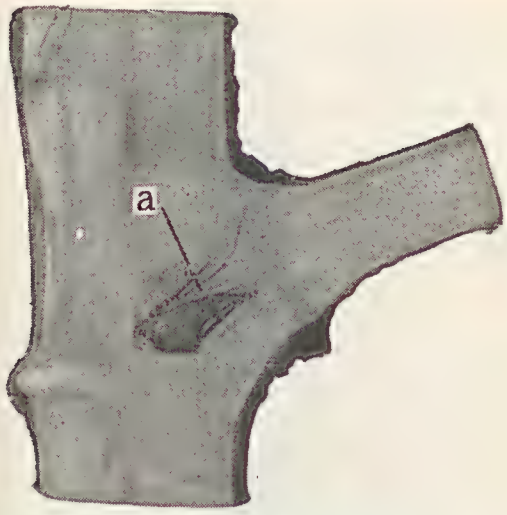


Fig. 44.—Longitudinal section through a peg graft several years after grafting. The original wedge-shaped basal end of the scion can be seen at "a."

Preparation of the Scion.

Fig. 46 (*a* and *b*) shows the type of scion to be used for the peg graft. It is about $\frac{3}{8}$ inch in diameter and 5 inches long. The basal end is cut to a short wedge, $\frac{1}{2}$ inch long, and a bud is retained near the shoulder of the wedge. The other end is cut straight across, about $\frac{1}{2}$ inch above the top bud to prevent this bud from being injured while the scion is being tapped into position.

Insertion of the Scion.

The insertion of the scions is commenced at the base of the limb, tapping each one into position with the mallet until the top of the wedge is level with the bark of the stock.

Tying, Sealing, &c.

Tying is unnecessary with this graft, but it should be sealed as soon as possible with a thick sealing material.

Bark Grafts.

Bark grafts are so called because the scion is inserted between the bark and the wood of the stock. Variously shaped cuts on the scions and stocks are made to facilitate the insertion of the scion and to increase the area of contact between the respective cambial regions. Bark grafting, for frame-working, cannot be commenced until the bark of the stock separates readily from the wood. It is a matter of personal preference and speed which type of bark graft is used.

"L."—Bark Graft

So called because the cut made in the bark of the stock is "L"-shaped.

Preparation of the Stock.

First the stock is poled. An "L"-shaped cut is made in the bark on the top side of the limb. The long arm of the "L" is about $1\frac{1}{4}$ inches in length, and is made at an angle of about 45 deg. across the limb. The short arm should be about $\frac{1}{2}$ inch long. The flap of bark is raised and a short "V"-shaped piece of bark is removed from below the base of the long arm of the "L." The cuts are spaced about 8 inches to 10 inches apart along each limb.

Preparation of the Scion.

A suitable scion for the bark graft is shown in Fig. 38, September *Journal*. A sloping cut about $1\frac{1}{2}$ inches long is made at the base of the scion and a thin slice of bark is removed from the side of the wedge which will fit against the long arm of the "L" cut on the stock. The sloping cut is made so that a bud is retained about $\frac{1}{2}$ inch from the end of the scion.

Insertion of the Scion.

The cut surface of the scion is inserted under the bark at the corner of the "L" cut so that it lies against the long arm of this cut, and in the "V"-shaped groove (Fig. 45).

Fig. 45.—Lower left, "L" bark graft; upper right, needle graft, showing long split due to the use of a thick scion.

Tying, Sealing, &c.

The graft is either tied or tacked, and then sealed.

"V."—*Bark Graft*

The "V" bark graft is so called because a "V"-shaped cut is made in the bark. This graft has not been used extensively in Victoria, but is included here because it is simple, and can be performed quickly. The grafts are spaced 8 to 10 inches apart along the limb.

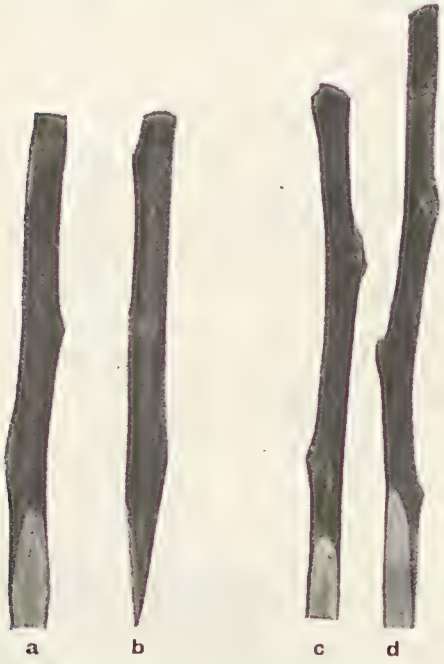


Fig. 46.—a and b, views of scion used for the peg graft and the side-cleft graft; c and d, scions used for gouge graft showing long and short sides of the wedge.

Preparation of the Stock.

The stock is poled. Two converging cuts, ½ inch apart at the broad end and not meeting at the apex, are made on the top side of the limb. The bark is then lifted at the broad end of the "V" with the end of the knife blade, which should be ground chisel-shaped, or the scion may be forced between the bark and the wood without the aid of the knife.

Preparation of the Scion.

A wedge-shaped scion, similar to that used in cleft grafting, is cut, and thin slices of bark are removed from the sides of the wedge.

Insertion of the Scion.

The wedge of the scion is pushed beneath the "V"-shaped flap of bark. The protruding edges of the flap of bark are then trimmed.

Fig. 47.—Inverted "T" bark graft. Preparation of the stock as it appears to the spectator.

Fig. 48.—Inverted "T" bark graft, showing scion in position.

Tying, Sealing, &c.

No tying or tacking is necessary with this graft, because the pressure of the bark holds the scion in position. Sealing should be done immediately.

"⊥" (inverted "T")—Bark Graft.

The cut made in the bark of the stock, as it appears to the operator, is "⊥" (inverted T)-shaped.

Preparation of the Stock.

The stock is poled. The inverted "T" cut is made in a similar manner to that used in budding, but the longitudinal cut is made across the limb at an angle of about 45 deg. The flaps of the bark are raised and a small "V"-shaped piece of bark is removed from below the centre of the cross cut of the "T" so that the scion will be close against the stock (Fig. 47). To the spectator this cut appears as a "T" cut, but the operator working above and facing in the opposite direction actually makes an inverted "T" (⊥).

Preparation of the Scion.

A sloping cut, about 1½ inches long, is made at the base of the scion, in such a position that a bud remains about ½ inch from the basal end (Fig. 38, September *Journal*).

Fig. 49.—Needle grafts before and after sealing. The end of the limb has been strap-grafted.

Insertion of the Scion.

The scion is pushed under the flaps of bark so that its sloping cut surface rests on the wood of the stock (Fig. 48).

Tying, Sealing, &c.

On thick limbs, this graft is tacked. A tack is driven through each flap and through the scion. On limbs of small diameter it is tied with raffia. The graft is then sealed.

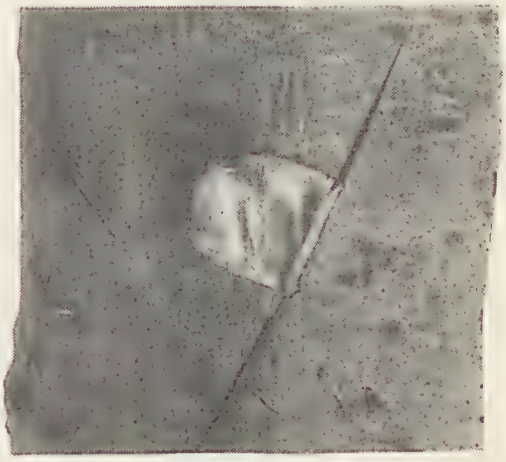


Fig. 50.—The stock prepared for the gouge graft (enlarged).

Needle—Bark Graft.

The needle graft derives it name from the needle-like tool used to make the incision in the bark of the stock. Frequently a modified packing needle (Fig. 6, p. 325, July *Journal*) is used. This is the quickest method of framework grafting.

Preparation of the Stock.

The stock is poled. The needle is held at an angle of about 30 deg. above the horizontal, and almost at right angles to the limb, and the point is inserted through the bark on the top side of the limb until the resistance of the underlying wood is felt. The hand and the needle are then lowered to the horizontal. This movement raises the bark from the wood.

Preparation of the Scion.

A thin, wedge-shaped scion is prepared similar to that used in cleft grafting (p. 435, September *Journal*). Thick scions are undesirable because they cause long splits in the bark of the stock.

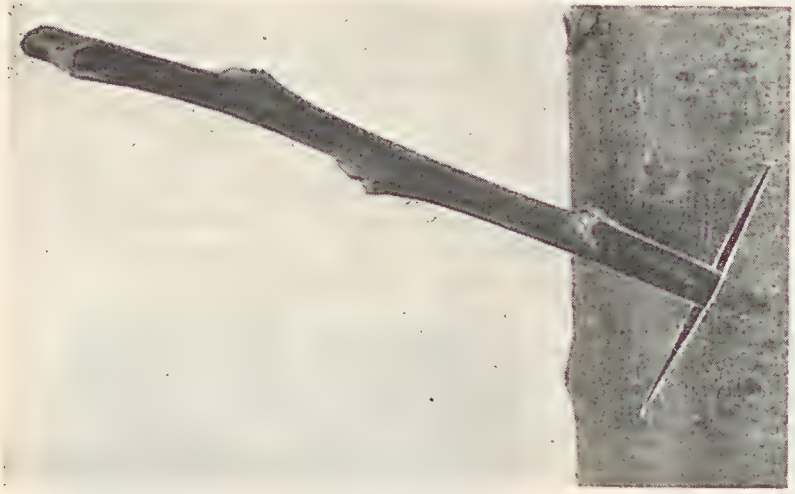


Fig. 51.—The gouge graft showing the scion in position and before sealing.

cut, is removed with the gouge (Fig. 50). When the piece of bark has been removed the surface of the wood should be exposed.

Preparation of the Scion.

A thin, wedge-shaped scion, about 5 inches long, is prepared, with one face of the wedge longer than the other (Fig. 46, *c* and *d*).

Insertion of the Scion.

The scion is forced between the bark and the wood of the stock so that the end of the longer face of the wedge lies in the hollow made by the gouge (Fig. 51).

Insertion of the Scion.

The needle may be allowed to remain in the bark and used as a lever until the point of the scion is inserted. The needle is then withdrawn and the scion is pushed between the bark and the wood until the wedge is just covered (Figs. 45 and 49). It is very important to insert the wedge in the cambial region between the wood and the bark. Failures, particularly with thick-barked trees, occur with this type of graft because the scion is pushed *into the bark* instead of *between the bark and the wood.*

Tying, Sealing, &c.

No tying is necessary, because the pressure of the bark holds the scion firmly in position. The graft is sealed as soon as possible.

Gouge—Bark Graft.

The gouge graft is so called because a ¼-inch gouge (Fig. 5, p. 325, July *Journal*) is used in the preparation of the stock. It is one of the best and quickest of the frame-work grafts.

Preparation of the Stock.

The stock is poled. An inch cut is made across the bark, at an angle of about 60 deg. on the upper surface of the limb, and a piece of bark, about the thickness of the scion, on the near side and in the middle of this

Tying, Sealing, &c.

No tying is necessary. The graft should be sealed immediately.

Stub Grafts.

When a graft is made on a shortened lateral growth arising from the main leaders, it is called a stub graft. In frame-working, this term is used to distinguish these grafts from the peg and bark grafts, in which the scions are inserted into the main leaders. When re-working apple and pear trees, both bark and

Fig. 52.—Apple limbs one year after stub grafting.

Fig. 53.—Bark stub graft, tied, before sealing. The end of the limb has been strap grafted.

stub grafts are frequently employed. It is usually impossible to re-work a tree completely by means of stub grafts, because there are not

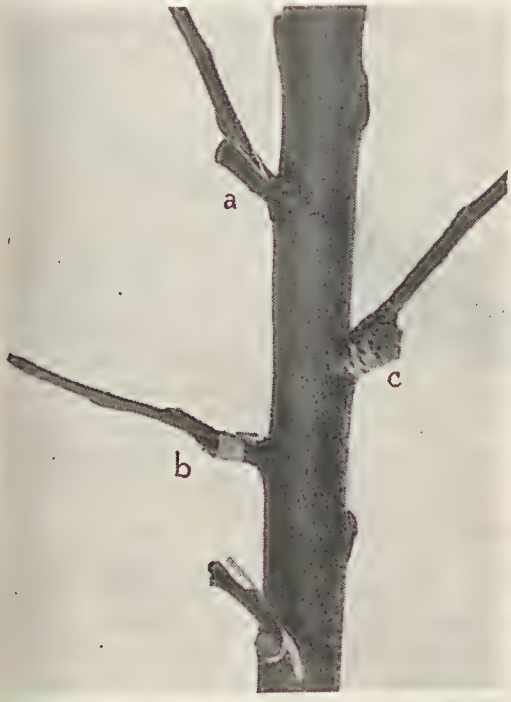


Fig. 54.—Cleft stub graft—side split. (a) scion inserted; (b) tied; (c) sealed.

sufficient suitable lateral growths, or because these growths do not always occur in the correct position. When poling (see p. 482) is being done, suitable lateral growths should be retained for stub grafting, and should be shortened back to not more than 2 inches in length. This method of grafting is recommended because more vigorous growth is made by the scions on these stubs than by peg and bark graft scions on the main limbs. Some

Fig. 55.—Whip-tongue stub graft. (a) scion in position; (b and c) tied with waxed cloth. The remaining graft is tied with raffia and will require sealing.

methods of stub-grafting—e.g., the cleft grafts, both mid-split and side-cleft, and the whip-tongue—can be commenced some weeks earlier in the season than the bark grafts.

Bark—Stub Graft.

The bark stub graft is performed on the stub in exactly the same manner as described for the bark graft on p. 438, September *Journal*. Tying with raffia, however, is preferable to tacking. Sealing is necessary, unless the graft is tied with waxed cloth (Fig. 53).

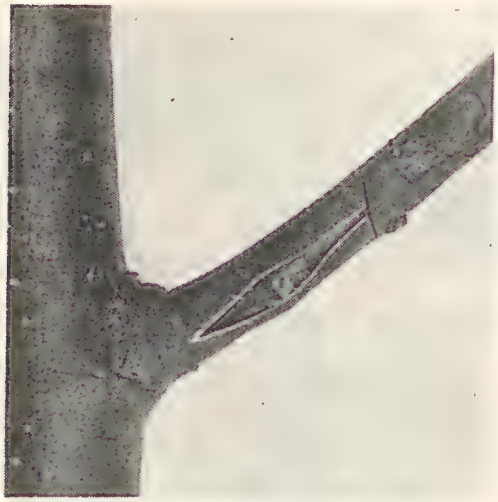


Fig. 56.—Bud in lateral, before tying.

Cleft—Stub Graft.

Mid-split.—The method of doing this graft has been explained on p. 435, September *Journal*. The only difference is that it is performed on a stub about 2 inches in length.

Side-split.—On the top side, and about half way up the stub, a deep slanting cut is made about ½ inch in length. The cut should not penetrate more than half the diameter of the stub. The base of the scion is made wedge-shaped, and it is inserted in the cut so that its cambial region and that of the stock are in contact. Before inserting the scion, slight pressure on the end of the stub opens the cut and facilitates the placing of the scion in position. This graft is tied with raffia or string, and is then sealed (Fig. 54).

Whip-tongue—Stub Graft.

The whip-tongue graft used for stub-grafting is performed in the same manner as that described under top-working methods, p. 436, September *Journal*.

Bud in Lateral.

In the bud-in-lateral method of frame-working, the tree is poled during the winter and the new lateral growths arising from the leaders are budded in the following summer. These lateral growths require thinning out, and only the most suitable ones, spaced about 10 inches apart, are selected for budding. The bud is inserted as near the base as possible (Fig. 56). The method has been described in detail on p. 387, August *Journal*. The following spring, the stock growth above the inserted bud is removed. This causes the bud to grow.

If budding fails, the laterals can be stub-grafted.

Although recommended, the disadvantages of this method of re-working are that one season's growth is lost, and that the lateral growths do not always occur in the desired positions on the stock.

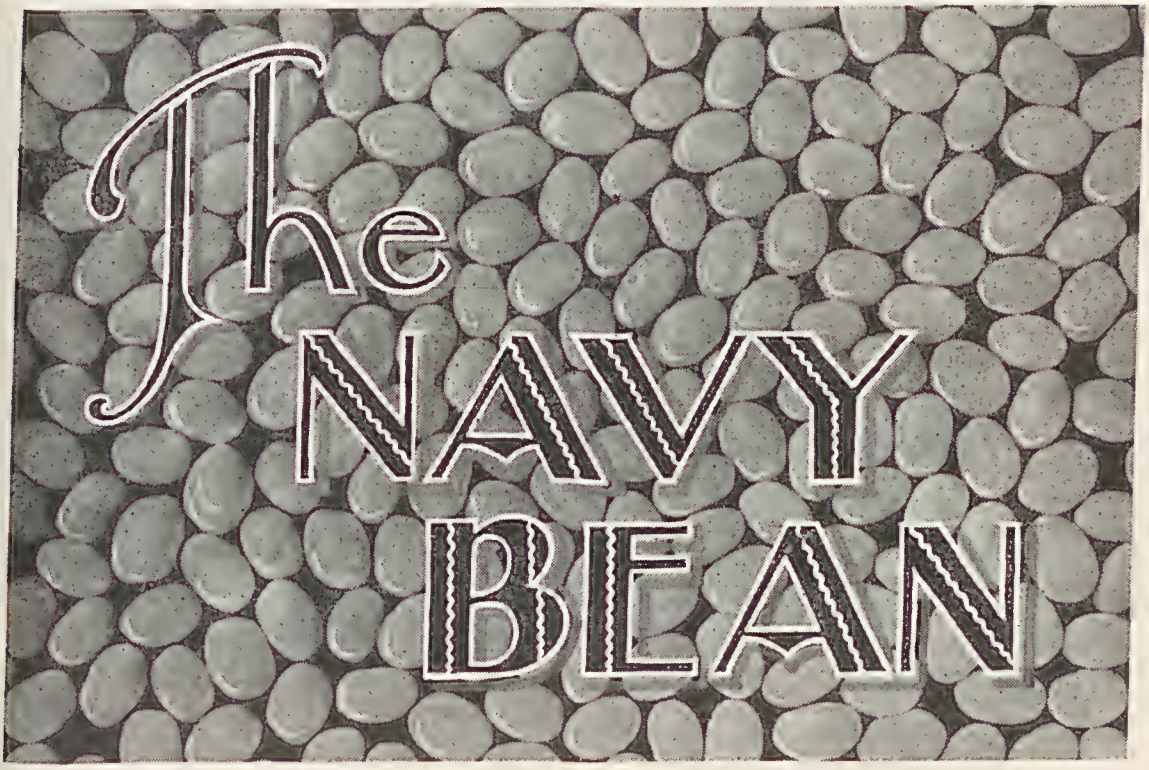
Fig. 57.—Bud in lateral method of frame-working, showing one season's growth from buds.

The foregoing is the fourth instalment of an article dealing with the subjects of Budding, Grafting and Re-working of Fruit Trees. A further instalment will appear in a subsequent issue of this Journal.

Prosecutions under the Cattle Compensation Act.

Several informations were issued recently for breaches under the Cattle Compensation Act, the offending parties being charged with not giving the necessary stamped statement within seven days of a sale of cattle as required by Section 12 of the Act.

The cases came before Mr. Burke, P.M., at Stratford, on the 15th September, and fines of 15s. and £1 were imposed with costs.



By F. A. Maher, B.Agr.Sc., Assistant Horticultural Research Officer, and G. N. Hyam, Seeds Officer.

The opportunity of introducing a quite new and profitable cash crop into the rotational programme of the mixed farmer or small crop specialist seldom presents itself, but in the navy bean we now have such a crop, the war having prevented the usual importations into this country. For two seasons the Department of Agriculture has carried out trials with this crop, and is able now to recommend it to Victorian farmers. However, the nature of the crop and prevailing conditions suggest that growers should endeavour to obtain a contract for the sale of the produce before planting any considerable area.

NAVY beans, as we know them, are the small, white beans used by the canning industry for the preparation of "baked beans." Hedrick, in "The Vegetables of New York," states that "the term 'navy bean' is an abbreviation of 'navy pea-bean.' The word 'navy' in no way characterizes the variety, but merely refers to the preference of the American Navy for beans of this type."

They come under the classification of Dwarf French Beans (*Phaseolus vulgaris*), of which there are almost 400 distinct varieties. Of these, only 50 or so are suitable for use as dried beans, and still fewer are regarded as suitable for canning. We in Victoria are familiar only with the small white-seeded types, such as "Little Navy," which alone are acceptable to the canning trade.

Figures of the consumption of navy beans over the past five or six years show a consistent increase in demand by the civilian population. The Commonwealth demand in 1937-38 was approximately 2,000 tons. The inclusion of baked beans in the diet of troops in the field has now doubled that demand, and, in addition, because of the superior quality of the navy bean, the grocery trade is buying this type in preference to the larger haricot bean.

The U.S.A. and Canada have always supplied the greater portion of the Australian demand, the landed cost of American-grown canning beans prior to the present war being approximately £1 per bushel of 60 pounds. Prior to the Sino-Japanese war, considerable quantities of "Kotenashi" and "Otenashi"

beans were imported as a substitute for the American "navy" bean, the landed cost being approximately 15s. per bushel, but, for their purposes, canners regarded them as inferior to the American bean. The cessation of imports from Japan resulted in all supplies of canning beans being obtained from America. More recently, however, the reduction of imports from non-sterling countries, and the uncertainty of supplies arriving at all, have caused canners to look to local growers for at least portion of their requirements, Last season, Australia's total area planted to navy beans was approximately 400 acres. Present requirements could not be met by less than 4,000 acres, which gives ample scope for the adoption of the crop by enterprising small-crop farmers.

Fig. 2.—Navy bean plant at mature green stage, showing prolific cropping habit, and development of short runners.

The requirements as to quality in the final product are high. From the canner's standpoint, high quality means a bean sample uniform in size and colour, defect free (i.e., free from shrivelled, broken, cracked, or weevil-infested seed), and one which absorbs moisture uniformly and does not split or disintegrate in processing. A bright, white bean of the size and grade indicated in Figure 1 is required. Australian canners regard types similar to "Little Navy" as ideal for their purposes.

Fig. 1.—Navy beans, actual size. A well-graded sample of the size desired by canners.

Yields.

It would appear that the yield per acre of canning beans for any given area is greater than that of seed peas. A normal type of navy bean plant growing under good soil and moisture conditions produces approximately 40 pods, the average seed content of pods being six. Trial plantings in Victoria over a period of two seasons indicate that the average yield for this crop grown under favorable conditions is in the vicinity of 30 bushels per acre. Several areas have given higher yields.

Economics.

The crop is new to the State, and it is difficult to arrive at the cost of production per bushel under Victorian conditions. However, at the price offering for the 1941-42 crop —£1 per bushel for cleaned and graded beans of canning quality—profitable production in many parts of Victoria is possible. There is reason to believe that the price will not fall below this level for some time to come.

Requirements of the Crop.

(*a*) **Climate.**—The navy bean is essentially a warm season crop, its climatic requirements being similar in most respects to those of the

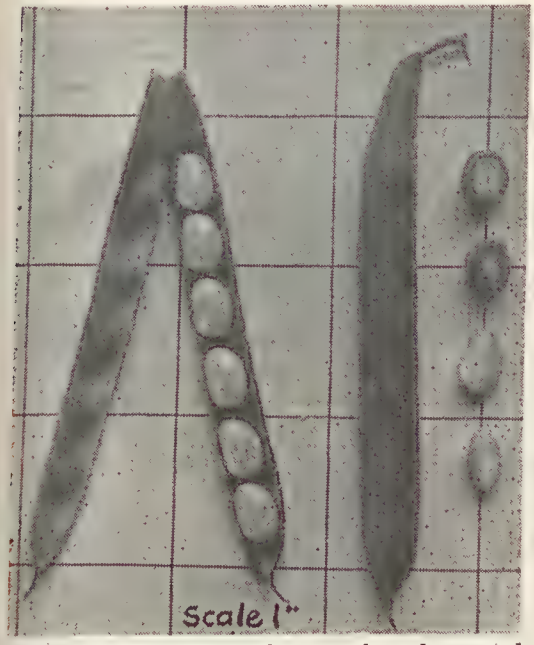


Fig. 3.—Navy bean pods opened to show seed at mature green stage.

well-known French bean. It is frost-sensitive, and requires warm growing conditions such as are experienced in Victoria during the period late October to early April. Where irrigation is not available, a regular but not excessive summer rainfall is required. Due consideration must be given to the fact that navy beans are essentially a seed crop. This limits the production of the bean to localities which are able to supply warm, dry conditions during the harvesting period. Wet conditions following immediately on the ripening of the crop, or during the field curing process, make successful harvesting much more difficult, and may result in seed discolouration and a consequent reduction in value.

(*b*) **Soil.**—Friable, well-drained soils are preferred for beans. Good drainage ensures that the seed will not rot if wet, cold weather follows planting. Looseness of the soil allows easy emergence of the young shoot, which is very delicate.

On soils which tend to dry out rapidly on the surface in mid-summer, the shallow-rooting navy beans may suffer unless summer rains are adequate. In such districts early planting, as soon as freedom from frosts will permit, should assist.

Soil colour is important if wet weather is experienced at harvest. Dark red soils and black soils tend to cause more staining of the seed than light coloured soils.

Trial plantings of beans on the better class volcanic soils of the Western District (Illowa, Koroit, Southern Cross) and Gippsland (Neerim, Warragul) and the swamp-lands of Bunyip have given encouraging results under natural rainfall conditions. The river flats of Eastern Gippsland (Orbost, Bairnsdale, Lindenow) have in each case produced excellent bean crops. Of the irrigation districts, Mildura and Woorinen would seem promising for the production of navy beans.

Cultural Methods.

(*a*) **Soil Preparation.**—The navy bean plant is rather delicate in the early stages of its growth. It is important, therefore, that the soil should offer little resistance to the germinating seed. Careful preparation of the ground to ensure a fine tilth is thus essential. Late autumn or winter ploughing where possible, with a series of cultivations, and a rolling before the final cultivation and immediately after planting, should make a satisfactory seed bed, and, what is equally important, contribute to a reasonably even surface for the operation of mechanical harvesting implements where used.

(*b*) **Time of Sowing.**—The time from seeding to maturity varies from fourteen to fifteen

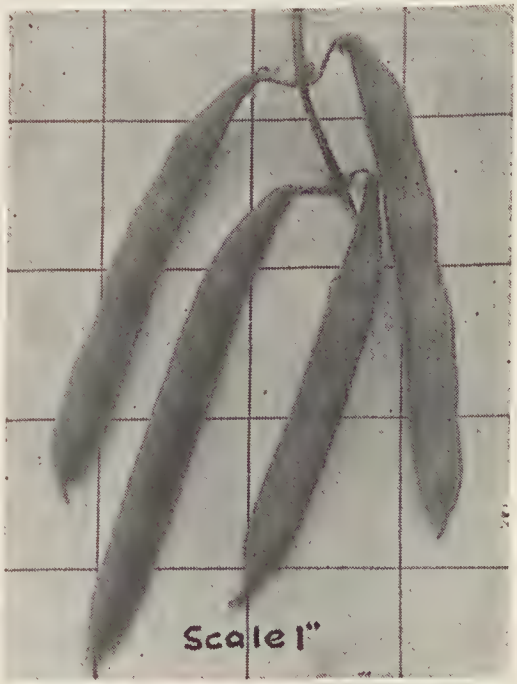


Fig. 4.—Navy bean pods nearing mature green stage, showing cluster-like (racemose) habit of bearing.

weeks. In areas where irrigation is not available, navy beans should be sown as early as possible, so that the crop will receive maximum benefit from spring rains. This means late September-October sowings in most southern districts. Harvesting then occurs during late January, February, and March, at which time the dry conditions desired for harvesting can be expected. In the northern irrigation districts, sowing may, if necessary, be delayed until December or January without fear of unfavorable weather during harvest time.

Where a considerable area is to be sown to beans, and where local growing conditions permit, it is wise to make a succession of sowings at intervals of a week or so. This method not only helps in spreading the labour demand at harvest time, but also minimizes the risk of unfavorable weather damaging the whole crop at the harvesting stage.

(*c*) **Seed.**—While beans for sowing should be of high quality, so that the crop will remain true to type, stained beans, if of good type, may be used for seed if necessary. The beans will keep without losing their germination capacity for at least three years. If they are kept longer than three years, their viability should be tested before they are used for seed. The Department of Agriculture will test seed samples for growers, free of cost. Poor germination means that higher seeding rates must be used.

Varieties have not yet been investigated in Victoria, but trials will be commenced shortly. In the meantime, seed of standard varieties is being used.

(*d*) **Seeding.**—This operation may be carried out in a variety of ways, the implements used often being determined by the other types of crops being grown on the farm. Sowing is carried out in some instances by hand, but mainly with maize and pea drills in which the usual type of feed plate is replaced by a bean plate designed to take the small seeded navy bean. It may not be economic to purchase these machines for areas of beans of less than 10 acres, unless they are used for alternative crops also. The ordinary grain drill, in which some hoes are blocked to give the desired row spacing, may be used, but the spacing of the seed in the rows is erratic unless the special cogs supplied by the makers for maize and peas are fitted. With both types of drill, the makers will be able to advise as to the necessary alterations.

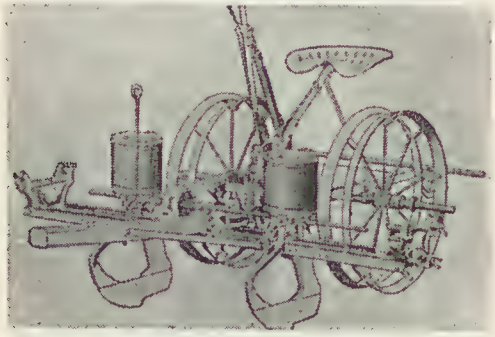


Fig. 5.—A double-row bean or maize planter used extensively in American bean-growing localities.

[After *U.S.D.A. Bul.* 1509.

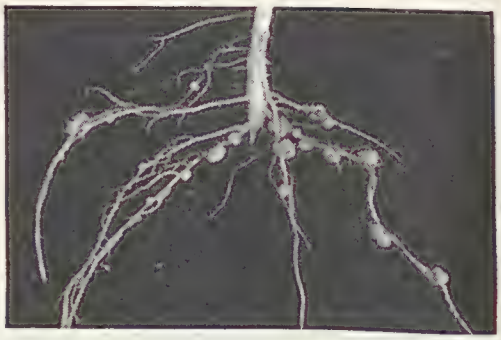


Fig. 6.—Bacterial nodule development on the roots of leguminous plants is essential for maximum crop production.

For very small areas (i.e., up to 5 acres), the "Planet Junior" hand drill is quite satisfactory.

Depth of sowing varies from $1\frac{1}{2}$ inches to 3 inches, the latter depth being safe only in light soils.

Rate of seeding depends on the viability of the seed sample and the spacing, but the usual amount required is from 30 to 35 lb. per acre.

(*e*) **Spacing.**—Under present Victorian conditions, taking into consideration the implements likely to be used for sowing and cultivation, about 30 inches between rows with 3 inches seed spacing may be considered normal practice, but on weed-free land as little as 18 inches between the rows, if this is more convenient, with 6 inches between the seed is satisfactory spacing.

(*f*) **Fertilizers.**—Legumes generally respond to superphosphate, but, because of their root nodules, are less dependent of the soil nitrogen supply. The navy bean is no exception as regards phosphate, and dressings of between

1 and 2 cwt. per acre at seeding time are profitable. So far, however, navy beans plants in Victoria have developed very few nodules, and it may prove necessary to "inoculate" the seed with the proper bacteria to make sure that they do. Until this aspect has been investigated, small dressings of sulphate of ammonia, say, half a cwt. per acre, will be needed in poorer soils to supply the nitrogen which the root nodules normally give to the plants.

Actual contact of the seed or young plant and the fertilizer is to be avoided, as both are very susceptible to fertilizer injury. If a grain drill is used for seeding, the fertilizer may be drilled in at the same time as the beans are sown, using all the delivery tubes except those feeding the beans. Maize, pea, and bean drills will sow seed and fertilizer without the two coming in contact with each other.

Where a seed and fertilizer drill is not available, the fertilizer may be broadcast just before sowing the seed, or applied in a shallow furrow a few inches to the side of the seed drill.

(*g*) **Protection.**—The plants are easily damaged by wind. It is advisable, therefore, where possible, to arrange the rows so that the prevailing winds will blow along rather than across them. In districts where winds are strong and erratic, growers would be well advised to plant narrow strips of maize, sunflowers, barley, or rye at intervals of one-half to one chain through the bean field for protection. Even in relatively sheltered areas, it has been noticed that wind-breaks are beneficial.

Where rabbits or hares are plentiful, it is essential that the fields be wire-netted.

(*h*) **Management.**—Apart from the eradication of weeds by cultivation between the rows, and the application of water in irrigation areas, the crop needs little attention. The canning bean is a surface rooting plant, and cultivation must be shallow and not too close to the rows, otherwise it will tend to damage the roots and cause the plants to wilt. Cultivation should be towards the row rather than away from it, except the final tillage, which should be away from the row, thereby leaving the surface as level as possible for the operation of harvesting implements. Irrigation, when used, should be frequent and light, at, say, 10-day to 3-week intervals depending on growing conditions.

Fig. 7.—Navy bean plant at the harvesting stage.

Harvesting the Crop.

Maturity.—Close inspection of the crop is a reliable guide in detecting the stage of development at which it is ready to be harvested. The stage of maturity at harvesting has an important influence on the quality and yield of the crop. Harvesting while the crop is immature results in a shrivelled light-weight product, while harvesting too late increases the risk of shattering of over-ripe pods. The navy bean, however, differs from most other dry-shell beans in that the crop can be left maturing in the field until the foliage has fallen, without undue risk of loss from shelling out of the seed. The beans should be left to mature until the plant turns yellow and the leaves dry and fall off. When most of the pods have become brittle and the seeds are hard, white, and shiny, the plants are ready to harvest. If the beans, through circumstances beyond control, become over-mature and the pods start to shatter, advantage may be taken of early-morning dews, which have a softening effect on the pods and enable the handling of the crop with less danger of the seed shelling out.

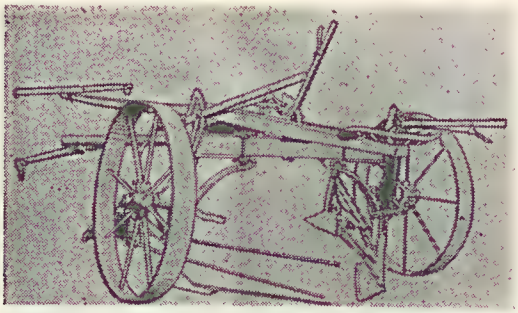


Fig. 8.—Double-row bean cutter.
[After *U.S.D.A. Bul.* 1509.

When the beans are to be harvested by direct harvesting machines, such as a header, they must be left until all the pods are brittle enough to thresh successfully. Direct harvesting machines will not handle the crop efficiently while the pods are moist with rain or dew.

Harvesting the Standing Crop.

In overseas countries, where large-scale production of dried beans is carried on, harvesting machines of the engine-functioned header type, such as are used in Australia for harvesting grain, but fitted with a special lifting attachment, are used. This is the most economical method of harvesting, as the machines harvest, thresh, and winnow in the one operation, the whole plant passing through the machine. A similar type of lifter fitted to the Australian machine is used successfully in Victoria for the harvesting of peas, and there does not seem to be any reason why local manufacturers should not be able to adapt their models to harvest beans.

The purchase of machinery specially designed for the handling of this crop would involve the individual grower in a considerable outlay, but in districts where there is a concentration of bean production the purchase of machinery on a community basis or for contract harvesting would solve the problem.

Harvesting by Reaping and Threshing.

Where harvesting machines are not available, garnering consists of several operations. The plants must be cut or lifted, thrown into cocks or windrows for curing, then threshed or stacked for later threshing. A number of improvised methods is available for each operation.

Lifting the Plants.—A skim plough or an onion skimmer set to the row spacing will loosen the plants efficiently A home-made version of the onion skimmer (Fig. 9) is used in America for areas up to 20 acres. The ordinary crop-mower, with a special lifter and the blade set very close to the ground to reduce the amount of shattering of low-hanging pods, may be used to cut the plants off instead of lifting them. Small areas may be pulled by hand or cut with a scythe. One grower is known to have lifted the plants with a pitchfork. A looped chain pulled by horses or tractor will lift the plants, but a good deal of seed is lost by this method.

Curing.—The interval between lifting the plants and placing the crop under cover (or stacking) is probably the most risky period in the process of production, for it is mainly during this period that spoilage by weather staining occurs. Immediately after the crop has been lifted from the soil, the plants should be thrown together in windrows consisting of four to six rows of the crop, or into small cocks. They may be thrown together by means of a pitchfork, or, on large areas, a side delivery rake.

The crop is left curing in these windrows for several days, the exact time depending largely on weather conditions. With the crop at the proper maturity, and under favorable weather conditions, curing of the beans until the last trace of greenness and dampness disappears occupies four or five days. Cold weather and rain may mean a considerable lengthening of this period. If rain does occur during the curing process, the windrows should be turned frequently until the plants are thoroughly dry. Failure to do this will result in a high percentage of stained or mouldy seed. Under dry conditions, curing in the field should not be carried on for too long a period, as over-drying results in loss of seed during transport to the thresher, and often causes the beans to crack in the threshing process.

Fig. 9.—A double-row sled bean cutter, used extensively in American bean-growing areas.

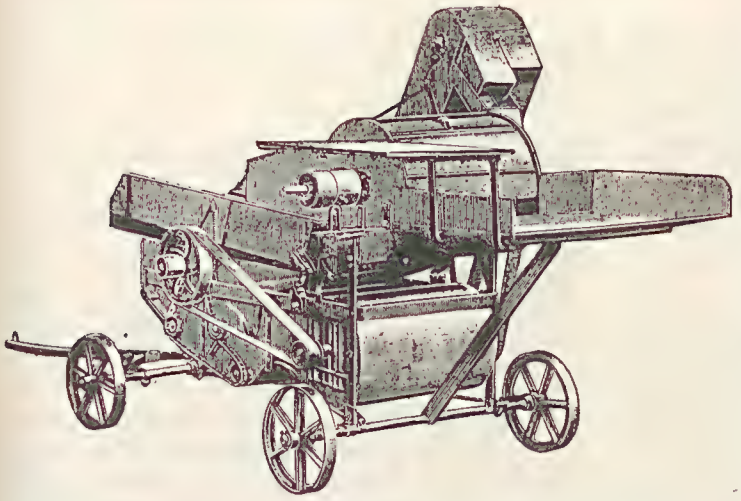


Fig. 10.—Portable grain thresher. This type of machine may be easily adapted to handling navy beans.

Stacking.—If threshing is not carried out immediately after curing, the crop should be placed under cover in a barn or shed, or built into a weather-proof stack. The stack should be under-laid with timber, or a layer of straw about 1 foot thick, to prevent loss of quality in the lower layers of beans by contact with moist soil, and should be made mouse-proof. Threshing may then be delayed at the convenience of the grower.

Threshing.—The method of threshing adopted depends almost entirely on the machinery used in the management of the farm on which the crop is grown. The primitive systems of flailing or rolling out the seed on canvas or bag sheets with a light horse-drawn farm roller are effective. Threshing may also be performed by passing the cured crop through a stationary header, or by running the header over the windrows after curing is completed. The standard wheat drum is used, but a special concave is fitted, this being necessary to thresh the grain properly and with a minimum of cracking.

Pea or bean threshers handle navy beans efficiently if they are run at the speed recommended by the makers, and the proper sieves are used. Too high a speed of the threshing drum tends to break the seed coat or crack the seed. Threshing by means of a chaff-cutter with the blades removed is a rather slow and inefficient method.

Whatever the system of harvesting and threshing used, dirt should be kept out as much as possible during threshing operations, to avoid soiling the seed.

Cleaning and Grading.—The degree of cleaning and grading necessary largely depends on the care exercised in growing, curing, harvesting, and threshing the crop. If sufficient care is taken in carrying out the various cultural operations and the crop receives no check in growth, a minimum of grading, if any, will be necessary. Beans requiring cleaning and grading can be sold only at a considerable discount, and some buyers will not accept such seed at all. Cleaning and grading may be carried out on the farm with a machine such as the "Little Wonder" winnower (Fig. 11), the whole outfit costing approximately £20. Stained beans have to be removed by hand-picking at the farm or cleaning establishment. A commercial sample should contain not more than one defective bean in 50.

Cleaned and graded beans should, of course, be packed in clean bags. They should be marketed as soon as possible. If stored, they should be properly protected against vermin and moisture.

Soil Improvement.

In addition to being profitable as a cash crop, navy beans are a valuable rotational crop. They belong to the legume family, and

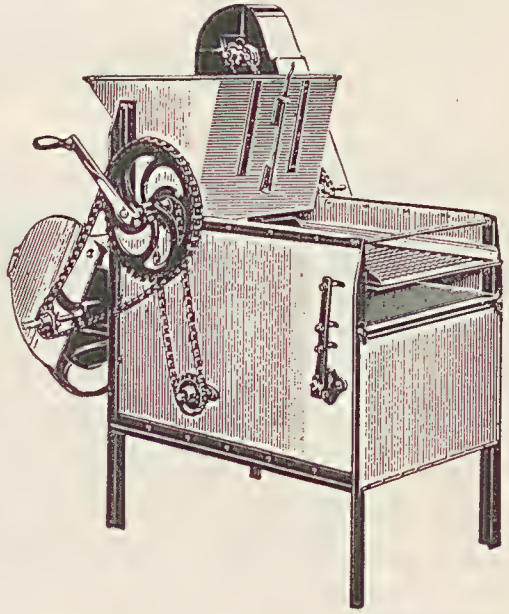


Fig. 11.—Hand or power driven winnower fitted with grading screens.

[Continued on page 514.

Live Stock Notes

Reminders for October—November

Compiled by A. C. T. HEWITT, M.Agr.Sc., Live Stock Science Officer

Conservation of Fodder.

THE time for silage and hay making is approaching, and preliminary preparations should now be made. Already, stock should have been removed from those paddocks which are to be cut. Hay sheds and stack bottoms should be cleaned up and repaired where necessary in readiness for the harvest and to eradicate vermin. Overhead and pit silos should receive similar attention, so that they will be ready before operations begin.

Mowers, reapers and binders, hay-rakes, hay-presses, silage cutters and blowers, hoists, sweeps, wagons, engines, harness, hay-forks, and all other machinery and gear should be thoroughly overhauled some time beforehand so that any necessary repairs can be made and spare parts obtained. This preparation will eliminate to a large extent unnecessary hold-ups. Similar preparations are necessary for grain harvesting.

There may be difficulty in securing a full team of harvest hands this season. It is imperative, therefore, that harvesting operations should run smoothly, without any breakdowns in machinery, so that the maximum amount of hay and silage for the amount of labour available may be conserved.

On most farms, fodder reserves have been depleted, but, as this season promises to be good in most districts, an opportunity for replenishing these reserves is presented. Prices of fodder can be expected to remain at high levels next year due to the small carry-over on most farms.

The type of fodder to be conserved will depend largely upon the crops grown. Cereal and lucerne hay and cereal grain will be the principal fodders conserved, but, in the dairying districts, grass-hay is popular, and is being made in increasing quantities each year. Baled grass-hay is coming into favour also, and bringing good prices. Some cereal and grass crops are conserved as silage. This type of conservation is recommended where weather conditions are too wet for the curing of good hay, where the crop is rank or contains many weeds which do not make good hay, or where there is plenty of labour to handle the silage.

Baled Pasture Hay.

Grass-hay, baled in the field and stored in conveniently placed weather-proof sheds and stacks, is the best method of conserving surplus grass. Machinery firms are meeting the demands of individual farmers by manufacturing small, strong, portable engine-driven baling presses at reasonable prices. Difficulties in securing wire for tying the bales are being overcome by thrifty farmers who untie the bales and keep the wires for use the following season. Baled hay is more easily handled both when carting in and stacking, and later when feeding out to the stock. It can be conserved in a smaller space than loose hay, with less waste.

To produce the very best grass-hay the grass should be cut while green, just as the pollen begins to show from the flowers, then raked into windrows and cocked before the sun bleaches out the green colour, and stacked or baled as soon as it is dry enough not to heat. While in the field, each shower of rain reduces the food value of the hay, and, when water penetrates the cocks, the hay further deteriorates. This is due to the effects of the rain itself, and the extra handling necessary to re-cock the hay for drying purposes. The new cocks will not be as weather-proof as the originals, and more green surfaces will be exposed for bleaching.

Deterioration in the stack is usually caused by moisture. When on faulty foundations, moisture may creep up from the ground, or, if the stack is badly built and does not shed the rain, moisture will penetrate from above and rot the hay. In a badly tied stack of loose hay, wind damage may occur.

By cutting grass at the correct stage of maturity, a better quality hay and a better aftermath will be obtained. Although the weight of hay per acre will be greater from a mature crop, it will contain much indigestible

fibre and probably less actual food units than the smaller weight of better quality hay made from grass cut at the correct stage.

Silage.

Silage first came into prominence in the United States of America as the best method of conserving maize and the sorghums. Crops making the best silage contain large quantities of carbohydrate. With these silage making presents few difficulties, but silage made from very immature pasture, lucerne, clover, and very succulent material may be a failure, as more skill and experience are required in their case. With these types of fodder the silos need to be filled more slowly than with maize and the sorghums, and the fodder should be cut nearer maturity or allowed to wilt for a short time before carting to the silo. The addition of about 40 lb. of molasses to 1 ton of such fodders assists in the production of a good type of silage.

Silage has advantages, in that it is fire and vermin proof, and that it can be made when weather conditions render hay-making impracticable. It affords an opportunity for extending the harvest season and the better utilization of labour by making silage early when the dews are heavy and the days relatively short and then, making hay later when there is better drying weather. The silage may be fed in the late summer and autumn, when the paddock feed is dry, and the hay during the winter when there should be green pickings. Many types of fodder which do not make good hay may be converted into very palatable silages.

Silage may be made in stacks, pits, or overhead silos, situated as closely as possible to where the crops are grown and to where the silage is to be fed. Silage is a heavy crop to handle on account of its high water content, and up to four times more silage, by weight, than hay has to be handled to supply the same number of nutrients. When being fed in the winter time cartage becomes a problem, because the heavy loads soon cut up the farm roads and paddocks, and it is then necessary to feed the silage adjacent to the stack or pit. The lifting of silage out of pits is also a laborious task.

Except under certain special conditions, less labour is required to make hay than silage. Baled pasture hay costs very little more to produce than loose hay. In fact, where the cured pasture hay is swept direct to the baling press and then carted and stacked near the farmstead, the cost per ton may not be more than that of carting and stacking loose hay. The cost of feeding out baled hay is several times less than that of feeding loose hay.

Without taking into account the cost of feeding out, good pasture hay costing, say, 35s. per ton to conserve, is as cheap as good pasture silage costing 8s. per ton, because 1 ton of hay contains as many food nutrients as 4 tons of silage.

Dairy Cows.

Summer fodder crops, such as maize and sorghums, should now be sown and arrangements for harvesting the surplus grass and special hay and silage crops made.

Cows to re-calve next August should be mated.

At this time of year, fodder taints are often the cause of low cream grades. These can be overcome to some extent by judicious grazing and leaving for hay those fields in which the worst taints are occurring. With the luscious growth causing scouring and with muddy lanes, gateways, and yards, the cows' udders are apt to be very dirty. Thorough washing of the udders will assist in maintaining high grades.

Sheep.

Sheep farmers will be very busy with shearing, dipping, marketing fat lambs, buying and selling sheep off shears, sowing summer fodder crops, planning harvesting operations, and even selecting rams for next year's lamb crop. Detailed information on any of these matters may be obtained by writing to the Director of Agriculture, Melbourne, C.2.

Pigs.

The annual pig-raising competition, sponsored by the Department of Agriculture, the Royal Agricultural Society, and the Stud Pig Breeders' Society, terminated in September with the exhibition of baconer and porker pigs and carcasses. The competition, which was initiated to foster competition among stud-pig breeders for the improvement of their stock, was held for the second year at the Melbourne City Abattoir, due to the cancellation of the Royal Show.

Unlike the usual pig show, judgment is based on performance rather than appearance, records being kept of the breeding, date of birth, total weight of the litter when eight weeks old, rate of growth to slaughtering weight and carcass quality. Marks are allotted to place equal value on the three factors—litter weight, rate of growth, and carcass quality.

Two pigs of the recorded litter constitute an entry for the Show. They must be even in weight, and one of the pair (which is drawn for) is slaughtered, and its carcass is appraised, thus exhibitors and visitors to the Show have the opportunity of studying and comparing the appearance of the live pig and the carcass, together with the records of their litter weight and rate of growth.

A sale of stud pigs was conducted in conjunction with the Show, giving pig breeders the opportunity to interchange breeding pigs.

For the benefit of pig breeders who were unable to attend the Show, a detailed report and photographs will be published in a subsequent issue of this *Journal*.

L. A. Downey, H.D.A., Pig Expert.

Poultry.

The price obtained for eggs depends upon their size, shape, cleanliness, and internal quality.

The more important factors which may affect egg quality are inferior breeding stock, inadequate feeding, unclean housing and accommodation for the birds, unclean and incorrect methods of gathering and packing the eggs, keeping the eggs at high temperature, holding them too long before marketing, and rough handling on the farm and during transit to market.

Eggs should be collected at least twice a day, and packed when cool in clean fillers and flats. They must be placed in the fillers with the large ends up, and no other material, such as chaff, should be used. They should be kept in a cool place, and marketed as least twice weekly during the warmer period of the year.

Clean eggs with a good shell texture realize higher prices than dirty, thin-shelled eggs. The shell of an egg is porous, and contact with dirt of any kind endangers the quality of the contents by allowing harmful organisms to penetrate the shell. Clean methods must be adopted, particularly in the provision of ample nesting material and accommodation. Clean and dry litter should be provided for the floor.

Eggs which require cleaning should be wiped carefully, when cool, with a clean damp cloth, and dried immediately. They should not be immersed, as this allows water, which may contain harmful organisms, to penetrate the shell. Strict cleanliness in every operation associated with the cleaning of eggs should be practised.

Eggs, being particularly delicate and fragile, demand special care at all times. They should be protected against unreasonable handling and transport shocks, to avoid damage to the shell and its contents.

The bulk of the eggs produced should be of the highest standard, and this is easily achieved by breeding from stock known to lay eggs of the right size, shape, shell thickness, and internal quality. Feeding on correct lines, keeping the birds under clean conditions, and adopting a general system of good management are essential also.

H. F. Clinton, Poultry Expert.

Bees.

Swarming may be expected during this month and hives should be prepared and fitted with frames in readiness for the increased number of colonies.

Under the swarming impulse several fine natural queen cells are usually built. These may be used by transferring the surplus to nuclei for queen rearing after the swarm has left the hive.

Where the rearing of a large number of young queens is anticipated, colonies should be selected for the purpose, artificial cells grafted with young larvae introduced, and, later, nuclei should be formed for the reception of the finished cells and housing of the young queens.

If an increase in the number of hives is not desired, extra supers should be placed on the hives to prevent overcrowding and a weekly inspection made of all brood combs. The building of queen cells should be discouraged by their destruction in the early stages. It must be distinctly understood that swarming is a natural instinct, and, under normal conditions, cannot be entirely prevented, but most cases may be brought under control and the measure of success is governed by the skill of the individual. Given plenty of room, colonies headed by young Italian queens usually cause very little trouble, but colonies with queens in their second and third years will often persist in re-building queen cells despite the most careful attention of the bee-keeper. In such cases, the old queen should be destroyed and a young laying queen introduced.

Grass should not be allowed to grow within 12 inches of the hive entrances.

Bees in box hives should be transferred to frame hives during the month.

J. W. Thomlinson, Apiary Inspector.

VARIETY IN POTATO RECIPES

By Rachel M. Peile and Mary D. White.

No housewife needs to be told that, at the present time, the remarkable cheapness of potatoes offers opportunity for considerable saving in household expenses. The food value of these vegetables stands very high ; they are appetizing, easily digestible and always welcome, and the solitary obstacle which often stands in the way of their more frequent use is the housewife's needless fear that daily servings of potatoes necessarily mean an uninviting menu.

A glance at the range of specially selected recipes below will show that actually there can be almost endless variety in the preparation of savoury and appetizing potato dishes. The housewife who tries them will be helping her purse and the family's health, and will be helping, too, the hardpressed primary producer.

If shape, size, and quality of skin permit, the best method of preparing potatoes is to scrub them well and bake, steam, or boil them in their skins ; thus preventing waste, saving the valuable mineral layer under the skin, obtaining a better flavour and saving time. If preferred, the skin may be removed after cooking. Potatoes can be cut into straws, chips, olives, or ribbons and wet-fried. Apart from the vegetable course, they can be used for soups, scones, entrées, pastry, biscuits, puddings, pancakes, salads, and pies.

Cocktail Potatoes :

Add butter, salt, and cayenne to some well-mashed potatoes. Mix well, then form into oval-shaped cakes, pressing a hollow in the centre, using a little flour to prevent sticking. Glaze with egg, coat with breadcrumbs or flaked oatmeal. Wet fry to a golden brown colour ; drain on paper. Cook some cocktail sausages in boiling water. Drain and place three in the hollow of the potato cases. Garnish with parsley. If liked, egg may be added to the potato mixture and it can be used to coat pieces of cooked sausage or bacon. These balls are covered and fried as described.

Savoury Baked Potatoes :

Bake six fairly large potatoes in jackets. Cut in halves, scoop out centres and mash with one-third cup hot milk, ¼ lb. grated cheese, salt, and pepper. Add stiffly beaten white of one egg. Refill cases and return to oven for 10 minutes. Cooked mince and gravy may replace the cheese and milk in this recipe.

Potato and Egg Casserole :

3 cups mashed potato ; 2 tablespoonfuls butter ; 3 heaped tablespoonfuls grated cheese ; 1 teaspoonful grated onion ; 4 eggs ; ½ pint white sauce.

Season potatoes, add butter, onion, and half the cheese. Put into greased casserole. Make four hollows in potato and break eggs in. Cover with sauce. Sprinkle with cheese and bake till golden brown on top.

Shepherd's Pie :

½ lb. cold minced meat; ½ onion (minced); salt; pepper; 2 cups mashed potato; 1 cup stock or gravy; 1 tablespoonful flour; 2 tablespoonfuls tomato sauce.

Grease dish and line with half the potato. Put stock, meat, onion, salt, pepper, flour, sauce into small saucepan and bring to boil and cook 10 minutes. Put into lined pie dish, cover with mashed potatoes, mark with a fork, sprinkle with small pieces of dripping and bake golden brown.

In place of above filling, cold cooked sausages and gravy may be used.

Mutton and Bacon Pie :

1½ lb. forequarter chops; bacon; onions; potatoes; salt; pepper.

Put layer of chops in dish, then in order, layers of bacon, sliced raw potatoes, and sliced onions. Sprinkle with salt and pepper. Continue till dish is full. Cover and cook 1½ hours. Remove cover and put on short crust or potato crust (see recipe below), bake light brown.

Potato Crust :

1 cup flour; 1 cup mashed potato; 2 teaspoonfuls baking powder; pinch salt; ¼ cup milk or water; 3 tablespoonfuls butter.

Sift flour, baking powder, salt. Cut in the butter, mix with mashed potato. Mix to a dough with milk or water. Roll out ¼ inch thick. Cover meat pie and bake about ¾ hour.

Poorman's Goose :

2 lb. potatoes; lamb's fry; breadcrumbs; 4 sage leaves; salt; pepper; 1 onion.

Parboil potatoes. Make seasoning of onion, sage, and breadcrumbs. Put a layer of potatoes at bottom of pie dish, then layer of lamb's fry, then layer of stuffing. Repeat till dish is full, finishing with potatoes. Half fill dish with cold water and bake 1–1½ hours. Serve hot with apple sauce.

Cornish Pasties :

½ lb. short crust; ½ lb. potato; ½ lb. steak; small piece turnip; salt; pepper; 1 small onion.

Dice steak, onion, turnip, potato, add salt and pepper, and mix. Cut short crust into six pieces and roll each into a round. Divide meat mixture, putting some on each round. Damp edges of pastry and pinch together over mixture. Glaze with milk or egg. Bake ¾ hour in fairly hot oven, gradually reducing the heat. Serve with sprigs of parsley.

Rolled Steak au Pomme de Terre :

Take steak and scatter over it salt, pepper, pieces of butter, finely chopped sage, and onion. Spread mashed potatoes over and roll up fastening with skewers. Put into casserole with cup of gravy or stock and bake slowly about 2 hours.

Potato Croquettes :

1 lb. mashed potatoes; salt; pepper; egg yolk; 1 dessertspoonful chopped parsley; 2 level tablespoonfuls butter.

Whip all ingredients together and form into croquettes. Fry golden brown in hot fat.

Potato Cheese Pie :

Boil six potatoes in their skins. When just soft, peel and slice fairly thickly. Put in layers in greased pie dish. Sprinkle with pepper and cover thickly with grated cheese.

Curried Potatoes :

1 apple; 1 dessertspoonful fat; 1 onion; 1 dessertspoonful flour; ½ pint milk; 1 tablespoonful curry powder; ½ lb. potatoes.

Melt fat in saucepan, fry diced apple and onion, add flour and curry powder. Brown well. Add milk and stir till boiling. Cut potatoes into dice, stir into curry and simmer 15 minutes. Serve with toast.

Meatless Cutlets :

½ lb. mashed potatoes; 3 tablespoonfuls cooked beans; 3 tablespoonfuls cooked peas; 2 tablespoonfuls grated cheese; 2 teaspoonfuls mint; 1 teaspoonful mustard; 1 egg yolk.

Mash vegetables together. Add seasoning, then mix in egg yolk. Shape into cutlets and bake in oven in a little fat till both sides are browned.

Vegetable Loaf :

1 cup cooked vegetables (potato); 1 cup crumbs; 1½ cups hot milk; 1 tablespoonful melted butter; salt and pepper; parsley; 3 eggs.

Pour milk over crumbs and mix butter, seasoning, cheese, and lastly, well-beaten eggs. Grease loaf tin. Mix mashed vegetables with milk and crumbs. Pour into tin. Bake about ¾ hour in slow oven till loaf is firm and set. Serve alone or with poached egg and bacon.

Potato Puffs :

4 boiled potatoes ; 1 oz. butter ; ¼ cup milk ; salt and pepper ; 2 eggs.

Separate yolks from whites of eggs and beat each. Mash potatoes, adding milk, butter, seasoning, and egg yolk. Fold in the egg whites, stirring lightly. Bake in individual dishes in moderate oven till brown and fluffy.

Potato Volcano :

6 potatoes ; 2 cups grated cheese ; 1 tablespoonful butter ; 2 eggs ; ½ teaspoonful mustard ; ¼ teaspoonful soda ; ½ cup cream or milk ; parsley, ½ teaspoonful salt.

Mash potatoes with salt, butter, and a little hot milk. Add half an egg and pile up on buttered serving dish (Pyrex), leaving hole in the centre. Brush over the top with remainder of egg and brown off top in hot oven. Make a rarebit—melt butter, add cheese, stir till smooth, then add seasonings, soda, egg and cream, stirring till blended. Pour this into central hole in potato. Garnish with parsley. Serve hot.

Potato Entree :

1 lb. freshly boiled potatoes ; 2 oz. butter ; ½ lb. crumbs ; 3 eggs ; chopped parsley ; ½ pint milk, pepper, and salt.

Mash potatoes, add butter, mix with crumbs, beaten egg, salt, pepper, parsley, and lastly milk. Pour into buttered dish and cover with layer of crumbs. Bake in hot oven for 20 minutes.

Potato Souffle :

1 lb. potatoes ; 1 tablespoonful butter ; 3 tablespoonfuls cheese ; 2 tablespoonfuls cream ; 3 eggs ; pinch herbs, salt.

Boil potatoes and mash using a little of the water in which they have been boiled. Return to saucepan with butter and stir till mixture thickens, pour into basin. Separate yolks from whites of eggs. When mixture is cool, add beaten yolks, cream, seasoning, herbs, beat well, add cheese, beat again. Lastly, stir in stiffly beaten egg whites. Turn into buttered dish and bake in hot oven for 10 minutes.

Potato and Nut Cakes :

1 lb. mashed potates ; 5 oz. chopped nuts ; 1 egg ; 1 tablespoonful butter, salt, pepper.

Add chopped nuts to potatoes, add butter and bind with egg. Season and beat till smooth. Make into round cakes, coat with flour, and deep fry.

Saratoga Chips :

Peel potatoes, slice very thinly, dry in a towel, drop into hot fat, fry golden brown. Drain in collander. If using frying basket, remove from fat after 2 minutes, heat fat again and plunge in again to brown.

Potato Straws :

As for chips, but cut in long match-like strips.

Potato Chips :

In strips about ¼ inch square at ends.

Potato Ribbons :

Peeled off in long ribbons and fried.

Potatoes Baked in Jackets :

Scrub potatoes, rub salt into skins or rub skins lightly with butter. Put on enamel plate or dish and bake in oven till tender, about an hour. Cut small hole in top and put in a small teaspoonful of butter and a little chopped parsley.

Potato Salad :

Serve cold diced, new potatoes, and cooked green peas on lettuce leaves. Mask with salad dressing. Sprinkle with chopped parsley or mint.

Egg and Potato Salad :

3 cups cold boiled potato ; 1 small onion ; 3 hard boiled eggs ; 1 heaped tablespoonful chopped parsley ; salt, pepper, dressing.

Chop onions finely, dice eggs and potatoes. Mix potatoes, onions and seasoning with dressing and chill. When ready to serve, mix in egg and parsley. Pile in lettuce leaves and serve garnished with gherkin.

Quick Potato Soup :

Cook an onion and a potato of the same size in just enough water to cover. Mash into the water, add a cup of milk and a piece of butter. Thicken with 1 tablespoonful flour moistened with milk. Season with salt, pepper, parsley, and a little sugar.

Vegetable Soup :

1 large carrot ; 1 teaspoonful cornflour ; 1 dessertspoonful butter ; 4 potatoes ; 2 large onions ; ½ pint milk ; salt and pepper.

Wash vegetables, peel and slice. Cook in a little water till soft ; mash to a pulp, add milk, butter, salt, and pepper. Moisten cornflour and add. Stir well. Garnish with chopped parsley.

White Soup :

1½ lb. potatoes ; 2 white onions ; 1 parsnip ; 1 tablespoonful dripping ; 2 cups milk ; 1½ tablespoonfuls flour ; 2 qts. water ; 2 teaspoonfuls salt ; 1 teaspoonful sugar.

Wash and peel vegetables and cut up roughly. Heat fat in saucepan and fry vegetables without browning, sprinkle with sugar and salt. Add water and simmer till tender. Rub through collander or sieve. Return to saucepan ; add milk. Moisten flour with a little milk and stir in to simmering soup. Garnish with chopped parsley.

Potato Scones :

1 lb. mashed potatoes ; ½ lb. self raising flour a little milk ; pinch salt.

Sift flour and salt, add finely mashed potato. Mix to dough with a little milk. Roll out lightly. Cut into rounds. Put on to hot floured tray. Bake in hot oven.

Potato Pancakes :

4 potatoes ; salt ; 3 eggs ; pepper ; 2 tablespoonfuls flour ; fat.

Wash and peel potatoes, grate into a basin. Stand for about 10 minutes, then pour off any liquid that collects. Add all ingredients and mix well. Drop in spoonfuls into the pan and fry until golden brown.

Almond Potatoes :

1 mashed potato ; beaten egg ; 1 tablespoonful grated cheese ; pinch cayenne ; ¼ teaspoonful salt ; shredded almonds, paper cases.

Mash potato till smooth, add flavouring and cheese. Bind into balls with a little of the egg. Dip in egg, roll in almonds and wet fry.

Potato Savouries :

These can be made by using potato chips in place of biscuits for savouries. They should be sprinkled with salt and pepper and decorated with tomato, cheese, gherkin, olive, &c.

Potato Lemon Pie :

½ lb. potatoes ; 1 tablespoonful butter ; 2 eggs ; ½ cup milk ; ½ cup sugar ; juice and rind of half lemon ; ¼ teaspoonful cinnamon ; pinch salt ; 6 oz. pastry (short crust).

Boil and mash potatoes, adding all ingredients and mixing well. Line plate with pastry. Pour in mixture. Bake in moderate oven. Before removing from oven, nuts may be sprinkled over.

Potato Pudding :

1 qt. milk ; ¼ lb. flour ; ¼ lb. mashed potato ; 1 oz. butter ; 3 eggs ; 2 oz. sugar ; 1 teaspoonful salt ; flavouring (grated lemon).

Mix flour to a smooth paste with a little milk, heat rest of milk, and when boiling, stir in flour, butter, potatoes, flavouring. When cooled, slightly add eggs, well beaten. Pour into buttered pie dish and bake till brown and set. about ½ hour.

Agricultural Lime . . .

The Significance of Colour

Following the article on agricultural lime (this *Journal*, February, 1941, page 57), several inquiries have been received as to whether the colour is any indication as to the quality of agricultural lime, and whether a yellowish lime is necessarily inferior to a white lime.

When lime is to be used for building or chemical purposes, the colour is of importance, because a limestone which will not burn white, or nearly so, is of limited use because of that fact. When, however, lime is to be used for agricultural purposes, the actual colour is of no significance provided the quality as represented by the guaranteed analysis is there. Some forms of soft limestone have a decidedly yellow tinge due to the presence of a very small amount of iron, but this yellow colour in no way detracts from its use for agricultural purposes. Provided the lime content and degree of fineness are the same, the effect on the soil would be the same whether the ground limestone be white, grey, or yellow.

It has already been shown in the above-mentioned article that, with any one type of agricultural lime, quality depends on lime content and degree of fineness. The Agricultural Lime Act provides adequate protection to the farmer as all brands of agricultural lime must be registered under that Act, and the guarantee as to degree of quality is given in the analysis on the tag attached to each bag. Quality is based on analysis rather than on colour.

Burnley Egg-Laying Competition,

1941-42—Results of Winter Test

By H. F. CLINTON, Poultry Expert

THE thirty-first Burnley Egg-Laying Competition commenced on the 1st April, 1941, and will continue until 2nd March, 1942, a period of 48 weeks. The winter test conducted in connexion with this competition included the first four months (122 days), and concluded on 31st July. For this test, certificates are awarded for the greatest number of first-grade eggs laid by teams and individual birds in all classes of the competition, provided that in section A a team lays 300 first-grade eggs and an individual bird 50 first-grade eggs, and in section B a bird lays 60 first-grade eggs. During the first two months, a first-grade egg must weigh not less than 1¾ oz., and thereafter not less than 2 oz.

The winter test is held annually for the purpose of giving prominence to the birds that lay well during this period, when prices of eggs are high. It is considered that egg production on commercial poultry farms could be considerably improved by breeding from birds that have laid a large number of eggs during the autumn and winter months.

It is very pleasing to note that, in the great majority of cases, all the eggs laid by the prize winning birds were first grade. Some very high scores were recorded, in most cases much higher than those of the winter test last year.

The highest number of eggs laid by a team of six birds in all classes of section A was recorded by Mr. F. W. Becker's Australorps, which laid 589 eggs, all first grade. The highest number last year was recorded by a team of six Australorps that laid 537 eggs (three of which were under first grade).

The highest number of eggs laid by an individual bird in all classes of the competition was recorded by a bird in a team of six White Leghorns owned by Mr. Becker. This bird laid 112 eggs, all first grade. Last year the highest number was recorded by an Australorp that laid 110 first-grade eggs.

The relative merits of the wet and dry mash systems of feeding have always been a subject for discussion, therefore the following table showing the number of eggs laid by each of the winning teams and individual birds in the sections and classes for White Leghorns, compared with those of the previous year, will be of interest. The figures would indicate that much depends on the laying capacity of the birds themselves:—

Section.	Class—White Leghorns.	Number of Birds.	1940.			1941.		
			Total Eggs.	Under Weight.	First Grade Eggs.	Total Eggs.	Under Weight.	First Grade Eggs.
A. Teams—Trapnested	Wet mash	6 6	463	..	463	530 531	1	530 530
	Dry mash	6	526	2	524	386	2	384
Individual Birds in A. Teams—Trapnested	Wet mash	1	96	..	96	112	..	112
	Dry mash	1	100	..	100	105	..	105
B. Individual Birds—Single Test	Wet mash	1	94	1	93	103	..	103
	Dry mash	1	88	..	88	111	..	111

Rhode Island Reds are again well represented in the present competition with a total of 74 birds.

Teams of Six.

In section A, class 1, White Leghorns, wet mash, Messrs. A. R. Marshman and F. W. Becker were equal for first prize, each of their teams having laid 530 first-grade eggs. Third prize was awarded to Mr. R. J. Francis for a team that laid 402 eggs.

In class 2, White Leghorns, dry mash, Mr. Becker, who won first prize in this class in the winter test last year, again secured first prize with a team that laid 384 first-grade eggs. One bird in this team laid 105 eggs, all first grade.

In class 4, Australorps, Mr. Becker won first prize with a team that laid 589 eggs, all first grade, the highest score in all classes of section A. Mr. W. Weston was second with a team that laid 458 eggs, and Mr. C. H. Harvey third with 427 eggs. One bird in a team in this class, owned by Mr. J. F. McLean, laid 105 eggs, all first grade.

In class 5, Rhode Island Reds, Mr. G. Winter secured first prize with a team that laid 496 eggs, all first grade. Two birds in this team each laid 102 eggs, all first grade. Second prize was gained by Fellows Bros. with a team that laid 433 eggs, while Mr. W. Tedstone was third with 342 eggs.

Individual Birds.

In the class for White Leghorns fed on wet mash, Mr. Becker won first prize with a bird that laid 103 eggs, all first grade. Mr. A. Bloxham gained second prize with a bird that laid 100 eggs, while another of Mr. Becker's birds was third with 98 eggs.

In the White Leghorn class, fed on dry mash, Mr. E. Wilson secured first prize with a bird that laid 111 eggs, all first grade, the highest score in section B. The same owner also gained second prize with a bird that laid 100 eggs, while Mr. J. R. Maddison was third with 89 eggs.

First prize in class 3, i.e., all light breeds other than White Leghorns, was awarded to Mr. D. Granter, whose Brown Leghorn laid 79 eggs, all first grade. Mr. J. See secured second prize with a Black Minorca that laid 62 eggs.

In the class for Australorps, Mr. H. E. Hill won first and second prizes with birds that laid 110 and 109 first-grade eggs respectively, and Mr. F. W. Becker gained third prize with 107 eggs.

Mr. J. W. Hattwell obtained first prize in the class for Rhode Island Reds, with a bird that laid 87 eggs, all first grade. Equal second prizes were awarded to Messrs. H. L. Chalmers and A. Perkins, each of their birds having laid 80 eggs.

In the class for all heavy breeds, other than Australorps and Rhode Island Reds, Mr. D. Granter, who won first prize with a White Wyandotte in this class in the winter test last year, again succeeded with a bird of the same breed that laid 62 eggs, all first grade.

PRIZE LIST.

SECTION A.—TEAMS OF SIX BIRDS—TRAPNESTED.

Pen No.	Name and Address.	Total Eggs.	Underweight.	First Grade Eggs.
	Class 1.—White Leghorns—Wet Mash.			
	EQUAL FIRST PRIZE—CHAMPION CERTIFICATE.			
6	F. W. Becker, Follett-road, Cheltenham, S.22	530	..	530
	EQUAL FIRST PRIZE—CHAMPION CERTIFICATE.			
19	A. R. Marshman, Archie's Creek	531	1	530
	THIRD PRIZE, GOVERNMENT CERTIFICATE.			
7	R. J. Francis, Chandler-road, Noble Park	428	26	402
	Class 2.—White Leghorns—Dry Mash.			
	FIRST PRIZE—CHAMPION CERTIFICATE.			
31	F. W. Becker, Follett-road, Cheltenham, S.22	386	2	384
	Class 4.—Australorps—Wet Mash.			
	FIRST PRIZE, CHAMPION CERTIFICATE.			
49	F. W. Becker, Follett-road, Cheltenham, S.22	589	..	589
	SECOND PRIZE, GOVERNMENT CERTIFICATE.			
69	W. Weston, 104 Broome-crescent, Wonthaggi	459	1	458
	THIRD PRIZE, GOVERNMENT CERTIFICATE.			
55	C. H. Harvey, Pakenham South	488	61	427
	Class 5.—Rhode Island Reds—Wet Mash.			
	FIRST PRIZE—CHAMPION CERTIFICATE.			
47	G. Winter, Murgheboluc ..	496	..	496
	SECOND PRIZE—GOVERNMENT CERTIFICATE.			
41	Fellows Bros., Outhwaite-road, West Heidelberg, N.23	433	..	433
	THIRD PRIZE—GOVERNMENT CERTIFICATE.			
45	W. Tedstone, Whitehorse-road, Balwyn, E.8	342	..	342

SECTION B.—INDIVIDUAL BIRDS—SINGLE TEST.

Pen No.	Name and Address.	Total Eggs.	Under-weight.	First Grade Eggs.
	Class 1.—White Leghorns—Wet Mash.			
	First Prize—Champion Certificate.			
13	F. W. Becker, Follett-road, Cheltenham, S.22	103	..	103
	Second Prize—Government Certificate.			
16	A. Bloxham, 23 Griffiths-street, Wonthaggi North	101	1	100
	Third Prize—Government Certificate.			
14	F. W. Becker, Follett-road, Cheltenham, S.22	98	..	98
	Class 2.—White Leghorns—Dry Mash.			
	First Prize—Champion Certificate.			
234	E. Wilson, 17 Stewart-street, Wonthaggi	111	..	111
	Second Prize—Government Certificate.			
233	E. Wilson, 17 Stewart-street, Wonthaggi	100	..	100
	Third Prize—Government Certificate.			
226	J. R. Maddison, Red Cliffs P.O.	89	..	89
	Class 3.—All Light Breeds other than White Leghorns—Wet Mash.			
	First Prize—Champion Certificate.			
204	D. Granter, 163 Martin-street, Gardenvale, S.4 (Brown Leghorn)	79	..	79
	Second Prize—Government Certificate.			
209	J. See, 46 Brunswick-road, Mitcham (Black Minorca)	63	1	62
	Class 4.—Australorps—Wet Mash.			
	First Prize—Champion Certificate.			
133	H. E. Hill, 20 Turner-street, North Wonthaggi	111	1	110
	Second Prize—Government Certificate.			
134	H. E. Hill, 20 Turner-street, North Wonthaggi	110	1	109
	Third Prize—Government Certificate.			
107	F. W. Becker, Follett-road, Cheltenham, S.22	107	..	107
	Class 5.—Rhode Island Reds—Wet Mash.			
	First Prize—Champion Certificate.			
185	J. W. Hattwell, 44 Ebden-street, Elsternwick, S.4	87	..	87
	Equal Second Prize—Government Certificate.			
175	H. L. Chalmers, 9 Lefevre-street, Spotswood, W.14	80	..	80
	Equal Second Prize—Government Certificate.			
192	A. Perkins, 5 Eastgate-street, Pascoe Vale South, W.7	84	4	80
	Class 5.—All Heavy Breeds other than Australorps and Rhode Island Reds—Wet Mash.			
	First Prize—Champion Certificate.			
199	D. Granter, 163 Martin-street, Gardenvale, S.4 (White Wyandotte)	62	..	62

FOR INDIVIDUAL BIRDS IN EACH CLASS OF SECTION A.

Pen No.	Name and Address.	Bird No.	Total Eggs.	Under-weight.	First Grade Egg
	Class 1.—White Leghorns—Wet Mash.				
	First Prize—Champion Certificate.				
6	F. W. Becker, Follett-road, Cheltenham, S.22	32	112	..	112
	Equal Second Prize—Government Certificate.				
6	F. W. Becker, Follett-road, Cheltenham, S.22	36	101	..	101
	Equal Second Prize—Government Certificate.				
19	A. R. Marshman, Archie's Creek	114	101	..	101
	Class 2.—White Leghorns—Dry Mash.				
	First Prize—Champion Certificate.				
31	F. W. Becker, Follett-road, Cheltenham, S.22	185	105	..	105
	Second Prize—Government Certificate.				
31	F. W. Becker, Follett-road, Cheltenham, S.22	186	73	..	73
	Third Prize—Government Certificate.				
37	Lenham Poultry Farm (F. Smith), Terang	222	74	2	72
	Class 4.—Australorps—Wet Mash.				
	First Prize—Champion Certificate.				
59	J. F. McLean, Follett-road, Cheltenham, S.22	349	105	..	105
	Second Prize—Government Certificate.				
49	F. W. Becker, Follett-road, Cheltenham, S.22	293	104	..	104
	Equal Third Prize—Government Certificate.				
49	F. W. Becker, Follett-road, Cheltenham, S.22	291	102	..	102
	Equal Third Prize—Government Certificate.				
49	F. W. Becker, Follett-road, Cheltenham, S.22	294	102	..	102
	Class 5.—Rhode Island Reds—Wet Mash.				
	Equal First Prize—Champion Certificate.				
47	G. Winter, Murgheboluc	279	102	..	102
	Equal First Prize—Champion Certificate.				
47	G. Winter, Murgheboluc	282	102	..	102
	Third Prize—Government Certificate.				
41	Fellows Bros., Outhwaite-road, West Heidelberg, N.23	244	89	..	89

The Selection and Maintenance of Starter Cultures for Cheesemaking

2.—Factors Affecting the Vitality and Longevity of Starter Cultures

By T. M. JENSEN, B.Agr.Sc. (N.Z.), Principal, School of Dairy Technology, Werribee

IN the previous article which appeared in the August issue of the Journal, the requirements in a good cheese starter, and the various types of starter available for cheddar cheesemaking were discussed. In the present article it is proposed to deal with the influence on the vitality and longevity of starters of such factors as bacteriophage action, adverse conditions in the milk, temperature of incubation, size of inoculum, and contamination with extraneous organisms.

Bacteriophage Action.

(a) Nature and Origin of Bacteriophage

Although it has been generally agreed by cheesemakers that the use of selected single-strain cultures represents, in many respects, a distinct advance on the use of the average mixed-strain starter, the introduction of the new starters did not overcome all of the difficulties experienced with starters in the factory. Most disturbing of the remaining troubles was the fact that the disastrous sudden death sometimes exhibited by starters still remained common and, indeed, appeared to occur more frequently with the single-strain starters than with mixed-strain starters. No explanation for this phenomenon was forthcoming until Whitehead and his co-workers (1) succeeded in demonstrating that this particular type of failure is brought about by the action of an agent known as bacteriophage, which has the power of completely destroying the susceptible bacteria in any culture in which it makes its appearance. The precise nature of this agent is not altogether clear; it is completely invisible under the highest power of the microscope and can be recognized only by its effects. In action it is similar to a virus, with the exception that viruses attack plants and animals, whereas bacteriophages attack bacteria. When bacteriophage gains entry to, or develops in, a pure culture of lactic streptococci, it attacks first some of the starter cells and brings about their destruction, being itself increased many-fold in the process. The greatly increased amount of "phage" then attacks many more starter cells and the process rapidly gains momentum until all the bacteria are destroyed. Microscopical examination of the starter just before the phage commences its action will reveal large numbers of starter cells, but a similar examination a short time later will reveal a complete absence of starter cells. This sudden destruction of the starter organisms may take place in the mother culture, in the bulk starter, or in the cheese vat itself during the course of cheese manufacture, and the result is inevitably a complete failure in further acid production. If a small quantity of phaged starter be now taken and passed through a bacterial filter, a clear fluid, free from bacteria but containing phage is obtained, and the addition of the most minute amount of this fluid to another culture of the same starter organism will rapidly bring about its destruction. In a similar way, the least contamination with milk from a dead starter or with whey from an affected vat will cause another culture of the same starter to fail in the factory. So potent, in fact, are these phages in their action that even the small particles of whey in the mist thrown out by a whey separator may each carry sufficient phage to bring about the destruction of a starter into which they gain access—a matter to which further reference will be made in a later part of this article.

The sequence of events which follows when a phage becomes active in a mixed-strain culture is usually somewhat different. In this

case it does not necessarily follow that a complete failure of the starter will result although complete failures of mixed-type cultures do sometimes occur (2). This is probably because phages are to some extent strain specific in their action, that is to say, a phage capable of attacking one strain of lactic streptococcus may not be capable of attacking other strains. A phage developing in a mixed culture of lactic streptococci may therefore destroy one or perhaps a few of the strains present, but other strains resistant to that particular phage will continue to grow and to produce acid. It is only when a phage capable of attacking all of the strains present in the mixture develops, or when a number of phages capable of doing this becomes active, that a complete failure of the mixed culture will result. Naturally, therefore, complete failures will occur less frequently with mixed-culture starters than with single-strain starters and for this reason the latter have come to be looked upon by some cheesemakers with disfavour. A complete failure in acid production during the course of manufacture, involving, as it not infrequently does, extensive spoilage of the cheese and heavy financial loss, is a serious matter to the cheese factory, and it is therefore not surprising that cheesemakers who lack the necessary facilities and information to prevent this trouble from occurring are quite content to forego the advantages of single-strain starters for the sake of the greater security afforded by mixed cultures from failures of this type. On the other hand, knowledge concerning the control of phage in cheese factories has now advanced to such an extent that complete safety from starter failure due to this cause can be assured provided, first of all, that suitable starter-making facilities are available and, secondly, that certain additional precautions in the technique of propagating the starter are scrupulously observed (3). Even where mixed cultures are in use, this new knowledge concerning the control of phage in cheese factories is none the less important for, while the action of phage on mixed-strain starters is usually such as to leave enough starter organisms in the milk or curd to produce sufficient acid to prevent the complete spoilage of the cheese, the loss of active strains from the starter may so impair its activity as to affect the quality of the cheese, and so render the replacement of the starter a necessity. Methods of starter propagation which aim at the control of phage action are therefore desirable regardless of the type of starter employed and for this reason the subject should be one of immediate interest to all cheesemakers.

The question as to the ultimate origin of phage has not yet been satisfactorily settled, but there are two possibilities concerning its occurrence in starter cultures. The first is contamination of the starter with pre-existing phage derived from some external source, and the second is spontaneous generation of phage by the starter organisms themselves in response to some as yet unrecognized physiological or environmental factor. The spontaneous generation idea is largely a matter of speculation, but whether it does or does not in fact occur is of little moment to the cheesemaker, for there is abundant evidence to show that the great majority of starter failures are due to contamination of cultures with pre-existing phage derived from external sources. Careful observations in this connexion have shown that the point at which phage first makes its appearance in the factory is in the cheese vats, and it is now believed that the whole problem of controlling phage in cheesemaking centres around the necessity for preventing its spread from this point through various channels to the starter itself.

(b) Mode of Development and Spread of Phage in Factories.

Experience has frequently shown that when a new single-strain cheese culture is introduced into a factory where it has not been used before, no difficulty will at first be experienced in propagating it successfully perhaps for a considerable period of time. Sometimes a trouble-free run of this nature may last for several weeks or longer, even though no special precautions are taken in the propagation of the culture. Finally, however, a sudden failure of the starter will occur and, thereafter, further attempts to propagate the same culture in the factory will probably result in a repetition of the same trouble. If laboratory examinations are made on the starter and on the whey from the cheese vats during the period while the starter is working normally, no evidence of phage will at first be found. Sooner or later, however, if these examinations are continued, small amounts of phage begin to make their appearance in the whey, although the starter still continues to work normally. Following this first appearance, the amount of phage present in the whey increases steadily, day by

day, until it is regularly present at the end of the cheesemaking process in high concentration. Still the vats continue to work normally, the starter organisms apparently suffering no ill-effects at this stage from the amounts of phage present. If tests are being carried out concurrently on the air inside the factory, it will be found also that, coincident with the appearance and development of phage in the whey from the cheese vats, the atmosphere of the factory is becoming laden with phage. Once this state of affairs has been reached, sudden failure of the starter may occur at any time unless certain special precautions are being taken to protect it from air-borne phage as well as from that which may enter through the better-known channels, such as improperly sterilized containers and utensils. Instances are on record where the exposure of a culture to the factory atmosphere by removing its cover for 10 seconds has been sufficient to bring about its failure in the next propagation. Failure of the starter in such a case is manifested either by the mother culture or the bulk starter failing to clot, or by the sudden cessation of acid development in the cheese vats during the course of manufacture, or by any combination of these phenomena. If a change-over is made to another starter the same cycle will be repeated within a longer or shorter period of time.

According to Whitehead and co-workers (3), the sequence of events outlined is probably initiated by a particle of phage (from some source as yet unrecognized) falling into the contents of the cheese vat which, in effect, may be regarded as a huge culture of the susceptible organism offering a large exposed surface to the factory atmosphere. When this occurs the phage multiplies with the starter organisms, though not to the extent necessary to bring about their destruction. As the whey containing phage is being removed from the cheese vat (and especially if it is being passed through a whey separator), phage becomes disseminated about the factory, and some of it is dispersed into the atmosphere. Consequently, a much greater amount of phage falls into the vats on the following day, and the resultant whey, being again richer in phage than previously, gives rise to a still greater pollution of the factory atmosphere and surroundings. This enrichment process goes on in the vats until a high concentration of phage is regularly present each day in the whey, and in the factory air. Under ordinary methods of starter propagation some of this air-borne phage soon gains access to the starter and brings about a failure either in the starter culture itself or in the vat. The reason why the starter does not fail in the vats as soon as phage makes its appearance in the whey is not fully understood, but it is possibly because the cheesemaking process is always completed before the concentration of phage necessary to bring about the destruction of the starter organisms is reached. Should an excessive quantity of stale whey containing phage be carried over in the vat from one day to the next it is conceivable that failure of the starter due to vat contamination would result, but in practice this rarely if ever happens. Investigation has shown that practically without exception, failure of the starter in the vat can be traced to contamination of the starter culture itself with phage. Apparently, the extent of the initial contamination that occurs either in the vats or in the starter, is almost invariably so small that the phage must multiply with the starter organisms for more than one propagation before it is able to build up to the concentration necessary to destroy them. If the contamination occurs in the vat, this opportunity to build up a sufficient concentration is not provided, since only one propagation of the starter takes place in the vat during the course of manufacture. On the other hand, it will be obvious that phage gaining entrance to the starter culture will have the opportunity for multiplying with the starter organisms for more than one propagation, and is therefore a much more potent source of trouble. The control of phage in the factory is therefore principally a matter of preventing it from gaining entrance to the starter culture itself either by the air route or through other channels; and if this can be accomplished failures in the vat due to phage action will be eliminated. At the same time, it will be clear that the greater the build-up of phage in the factory due to the carry-over of contamination in the vats from day to day the more difficult will become the task of preventing phage from entering the starter.

The Effect of Adverse Conditions in the Milk.

The milk used in the preparation of the starter, and also in the cheese-vat, may vary in suitability for the growth of starter organisms to an extent sometimes sufficient to cause serious difficulties. Little is known about

the influence (if any) of the chemical composition of the milk on the growth of starter, but there are at least two abnormal conditions due to bacteriological causes which may render milk quite unfit for starter-making, and also for cheesemaking.

(*a*) **Non-Acid Milk.**—The most common of these is what is known as "non-acid" milk, a condition which is encountered rather frequently in milk supplies to cheese factories during hot weather. Various degrees of this trouble can be experienced, but when non-acid milk is present in sufficient proportion, either in the starter-can or in the cheese-vat, the growth of the starter is completely inhibited. This trouble is often confused with the effects of bacteriophage, but there is absolutely no connexion between the two conditions. In the one case, the trouble is due to a particular condition of the milk and, in the other, it lies with the starter organisms themselves. On some occasions it may happen in a factory that one vat fails to produce acid, while other vats containing the same starter produce acid normally, thus indicating quite clearly that the trouble in the slow vat lies with the milk and not with the starter. A full discussion of the causes and control of "non-acid" milk would take up considerable space, but it will be sufficient to mention here that the condition is brought about by the growth in improperly-cooled milk of certain organisms capable of producing a substance which is extremely toxic (poisonous) to starter organisms. Pasteurization or sterilization of such milk will not overcome the condition once it has developed for, although the responsible organisms will themselves be destroyed by these treatments, the toxic effect remains undiminished. In selecting milk for starter-making it is therefore necessary to avoid the use of milk of this kind. Since the condition is more likely to be encountered to a serious degree in milks from individual farms than in mixed factory milk, in milk that is several hours old than in fresh milk, and in uncooled milk than in cooled milk, the best way of avoiding trouble from this source is to use the mixed morning's milk from a number of clean farms where cooling is efficiently carried out. As a further safeguard, milk supplies for starter-making may be submitted to a simple test devised by Cox (4) for the detection of "non-acid" milk. The same test may be used to great advantage for ascertaining which suppliers are at fault when difficulties due to non-acid milk are being experienced in the cheese vat.

(*b*) **Mastitis Milk.**—Instances have been reported by some observers where difficulties in starter propagation have been caused by mastitis milk. In the majority of these instances it appears that the milk of a single cow, or the mixed milk of a small number of cows, has been used. On the other hand, some authorities have reported a stimulating effect on starter growth by mastitis milk. Allowing, however, that some kinds of mastitis milk do exert an injurious effect on starter organisms, it nevertheless appears highly improbable that milk of this type will ever be present in sufficient proportion in the mixed milk of several reasonably good herds to exert any effect on the growth of the starter. The precautions already recommended for avoiding the use of "non-acid" milk should therefore be equally effective here.

The Effects of Temperature of Incubation and Amount of Inoculum.

These two factors are best considered together since, to a certain extent, their effects are inter-dependent.

It is a common belief among cheesemakers that one of the most important features in the management of starters is the necessity for avoiding "over-ripening" of the culture at any stage of its propagation. The term "over-ripening" used in this sense refers to the practice of allowing a culture to stand at high acidity after it has clotted and before resowing into a fresh batch of milk. The longer the culture is allowed to stand after clotting has taken place the weaker it is said to become, and there is a strong belief that in order to avoid injury to the culture and so enable it to retain its full vigour, this period should be reduced to a minimum. Resowing into another batch of milk just as the culture has coagulated is said to give the best results. Since both the amount of inoculum and the incubation temperature affect the rate of clotting, most cheesemakers endeavour to regulate these two factors in such a manner that the starter will be just nicely clotted by the time everything is ready for re-inoculating on the following day. Some experiments carried out recently with single-strain starters to test the truth of this contention showed, however, that the so-called dangers of over-ripening are not as great as they are popularly supposed to be. While it was found to be quite true that prolonged holding of a culture at high acidity for periods of several days and upwards would result in

injury to the starter cells and so lead eventually to their destruction, no apparent effect on the vitality of the starter could be produced by over-ripening under the normal system of management whereby a culture is re-inoculated into a fresh batch of milk daily. Even when the size of the inoculum was increased up to twenty times that normally required, the only apparent result was rather extensive wheying-off the culture; no reduction in vitality occurred. Such extremely heavy inoculations are, of course, quite unwarranted, but there is some evidence to show that there are advantages to be gained in standardizing the amount of inoculum to about 1 per cent.

The permissible limits of incubation temperature have not been fully investigated, but experience has shown that temperatures between 70 and 80°F. give the best results. At temperatures much below 70°F. the growth of the cultures tends to become inconveniently slow, while above 80°F. an effect comes into play which leads to a rapid and permanent decrease in the vitality of the culture. In this laboratory an incubation temperature of 75°F. and a rate of inoculation of 1 per cent. are regularly adhered to.

Effect of Contamination with Extraneous Organisms.

Since all types of bacteria except lactic acid organisms are likely to produce harmful effects in cheddar cheesemaking, contamination with extraneous organisms may reduce the usefulness of a starter and render it a definite menace to cheese quality. Consequently, sterilization of the milk in which the starter is to be grown and of the utensils used in its propagation are essential, and a thoroughly aseptic technique also must be maintained. The best practical procedure for fulfilling the various requirements mentioned in the course of this article, including the protection of the starter from air-borne phage, will be discussed in the third and final article of this series.

References.

(1) Whitehead & Cox, N.Z. J. Sci. Tech. 16, 319.
(2) Johns & Katznelson, Canad. J. Res. 19, 49.
(3) Whitehead & Hunter, J. D. Res. 12, 63.
(4) Cox, N.Z. J. Agr. 49, No. 4, 1934.

[*The concluding article of this series will appear in a subsequent issue of the Journal.*]

Accredited Brucellosis-free Herds (Swine).

The following herds of pigs have been accredited as free of swine brucellosis (contagious abortion of pigs) by the Department of Agriculture.

An accredited brucellosis-free herd of pigs is one in which all animals therein have been subjected to two successive blood tests for brucellosis with negative results at intervals prescribed by the Chief Veterinary Inspector of the Department.

In order to remain accredited, a semi-annual or annual re-test (as determined by the Chief Veterinary Inspector) of all animals in the herd shall be conducted. If at a re-test any animal fails to give a negative reaction to the test, the herd shall not be declared brucellosis-free again until two tests of the complete herd have been carried out with negative results.

Full particulars of the Accredited Swine Brucellosis-free Herd Scheme and application forms may be obtained from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Name.	Address.
Bowran, L. G.	"Glendare," Tallangatta
Bright, George H. ..	Dumbalk
Castle, L. H.	Clarinda
Critten, H. S.	Dumbalk
Doornbusch, John L. ..	"Starpark", Nhill
Fairchild and Clutterbuck	Tinamba
Harrison, C. T. ..	"Eastside" Stud, Pomborneit
Hawtin, I. E. & F. ..	"Rossmoyne", Colac.
Haywood, Dr. A. R. ..	Hastings
Horn, L. A.	Leongatha North
Longerenong College ..	Dooen
Pietsch R. E.	Katyil
Rintoul, J. T. C. ..	Glengarry
Roy, W. A.	Morrell's Hill, via Boolarra
State Experiment Farm	Rutherglen
Sutherland, R. N. ..	Nullawill
Trenery and Soderlund	"Promview", Foster
Trigg, A. J.	Bungaree
Trigg, N. H.	Bullarook
Tweddle, J. T. ..	"Winlaton," Shepparton
Walch, M. U.	Baring

In the Orchard

By J. L. PROVAN, B.Agr.Sc., Senior Horticultural Instructor

FOR the control of codling moth in pears it is particularly important that the arsenate of lead spray (5 lb. of paste, 80 gallons water) be applied before the calyx closes and the young pear droops. Two to three weeks after petal-fall is usually the best time to spray, but the application may be further delayed so long as it is done before the calyx closes and the pear turns over. It is particularly important that this spray should be directed downward into the calyces. Rods will be found more useful than spray guns for this purpose, and the addition of a small amount of oil (1 quart in 80 gallons) or an efficient spreader will improve the effectiveness of this spray.

There are many substances which, when melted together in various proportions, form a more or less suitable sealing material for grafts. The most common recipe is 4 lb. resin, 2 lb. beeswax, and 1 lb. tallow. The three substances are melted together, mixed thoroughly, and while still hot poured into cold water. When cool enough, the mixture is worked with greased hands until it becomes grained and light coloured. The consistency of this wax can be varied to suit the operator's requirements. Increasing the amount of tallow makes the wax softer, and increasing the amount of resin yields a harder wax. The warmth of the hands may be sufficient to make this wax pliable enough for sealing the graft, or it may be necessary to warm it over hot water. When the wax is heated, care should be taken to ensure that it is not hot enough to injure plant tissue. Melted wax can be applied with a brush.

Other suitable sealing materials are the "Colas" and starch mixture, "Colgraft," "Tree Salve," and "Mastic H." The first-named is made by heating together one tablespoonful of ordinary powdered starch and 1½ pints of "Colas" until the starch is "cooked." To thicken the mixture add more starch; to thin add more "Colas." This mixture makes a satisfactory seal if applied liberally. The other proprietary materials suitable for sealing grafts can be purchased ready for application at a cost of from 1s. 1d. to 1s. 3d. per lb. After the original sealing, grafts should be inspected frequently, and if cracking has occurred they should be re-sealed.

Aphis will now be making its appearance on peach, cherry, plum, and citrus trees and, if control of this pest is to be achieved, it is very important that the spray application should be made early before the young leaves curl, and so protect the aphis from contact with the spray. Nicotine sulphate 1 pint in 80 gallons, plus 2 lb. of soft soap, will be found very effective. The soft soap improves the wetting properties of this spray. Thorough and sometimes repeated applications are necessary to control this insect.

Instructional circulars dealing with the control of black spot of apples and pears and codling moth are available, free of cost, on application to the Department of Agriculture, Treasury Gardens, Melbourne, C.2.

In the Garden

By A. W. Jessep, M.Agr.Sc., B.Sc., Dip. Ed., Principal, School of Horticulture, Burnley.

AFTER the heavy rainfall in September, the preparation of the garden should be hastened in order to get the summer annuals planted as soon as possible. Transplant any of the following seedlings:—Aster, ageratum, antirrhinum, carnation, celosia, delphinium, marigold, nasturtium, petunia, phlox, scabious, and zinnia. Make another planting of gladiolus and dahlia, but leave the main planting until December to have them flowering in the autumn when the sun is not so fierce on the blooms.

The Gladiolus.

To obtain the best results from gladiolus, it is advisable to prepare the area now. Select a good open position and dig some animal manure about 9 to 12 inches below the surface, to enable it to be well decayed before the corms are planted. This manure should not be disturbed when preparations are being made to plant the corms, but left below the planting depth. Lightly fork over the area to keep down the weeds, and plant the corms according to the time the flowers are required. Corms planted in October will flower in about 100 to 110 days, but if planted in December-January, they flower in from 70 to 80 days. The primulinus or hooded types will flower approximately ten days earlier than the grandiflorus

or large flowering non-hooded types. Gladiolus may be planted at any time of the year, except from April to June, but, naturally, the growth is very slow in the winter. The foliage is not frost-tender in Victoria, but the blooms are.

Planting.—The depth of planting depends on the type of soil, the size of the corm, and the time of planting. In mid-season, if the soil is sandy, plant from 4 to 6 inches deep, but in a heavy soil, plant only 3 to 4 inches deep. The smaller the corm the shallower the planting. Early and late plantings are not planted as deeply as mid-season ones. For garden effect, plant in clumps of six to twelve of the same colour, allowing 8 inches between each corm and 2 to 3 feet between each clump. If grown for cut flowers, plant in rows 18 inches apart and 6 inches between the corms or in double rows 6 to 9 inches apart and 2 feet between the double rows.

Throw the beds up about 6 inches above the pathway, and leave a pathway between every six rows of plants. As some varieties flower sooner than others, it is advisable to group the planting according to the flowering period, so that the plants in each group will bloom at the same time.

Watering.—Always plant in a moist soil. If it is not naturally moist, give the area a good watering a few days before planting. No further watering should be required until the plants are well above ground. Water thoroughly as required, but not more frequently than once a fortnight. Light sprinkling is useless, as it encourages the roots to grow towards the surface.

Cutting.—Cut the blooms when the first two or three flowers are out and remove as little foliage as possible, as it helps in the development of the corm.

Treatment of Corms.—Lift about six weeks after flowering. Cut off the top and place the corms in a warm, well-aired place to dry off. Remove the old corm and loose skin and burn it to destroy any pests present. Store the corms in a cool, dry airy place, preferably in boxes with wire-netting bottoms. In the storage boxes, place about 1 oz. of flaked naphthalene per 100 corms as a control against thrips. Before the corms commence to shoot, dip them in a solution of corrosive sublimate at the strength of 1 in 1,000 parts for six hours. This controls thrips and many of the storage fungus diseases. Let them dry thoroughly, and if not ready to plant, store in containers that have been dipped in the solution or in which gladiolus have not previously been stored.

Varieties.—There are hundreds of very good gladiolus varieties of almost any colour, except good blues—

Alice Tiplady, apricot colour; Butter Boy, yellow; Tangarine, orange, scarlet. These three varieties are popular primulinus types for early flowers.

Picardy, light salmon—this variety is very popular in the cut-flower trade; Rose Dawn, rose colour; Canberra, yellow; Marmora, lavender grey; and Kalorama, salmon. All of these are good popular types.

If further information in regard to varieties is desired, the amateur grower is advised to obtain a catalogue from one of the well-known growers.

Vegetables.

As there is not likely to be any more frost this year, the main crop of tomatoes, potatoes, cucumbers, melons, pumpkins, squashes, and such frost-tender vegetables may be planted with safety. Make a further sowing of Greenfeast peas. This variety is considered the best mid-season and late variety for general use in Victoria. Plant French, butter, and climbing beans, using Canadian Wonder, Brown Beauty, or Feltham Prolific for the former, Startler for the butter, and Epicure, White Dutch, or Scarlet Runner for the climbing varieties. Sow any of the following seeds:—

(*a*) In a seed-bed to be transplanted later—

Cabbage—Drumhead or Improved Succession;
Celery—Improved White Plume or Golden Phenomenal;
Lettuce—New York, Iceberg, or Webb's Wonderful.

(*b*) In their permanent positions—

Red Beet—Crimson Globe or Rapid Red;
Carrots—St. Valley, Chantenay, Early Shorthorn;
Parsnips—Improved Hollow Crown;
Swede Turnips—Earliest of All, Champion, Purple Top.
Silver Beet—Fordhook Giant or Lucullus;
Radish—Crimson Giant, Early Ruby, China Rose.

Standardization of Agricultural Equipment

G. H. Vasey, B.C.E., Lecturer in Agricultural Engineering, University of Melbourne

STANDARDIZATION is simply the policy of ensuring that things assumed to be similar are in fact similar. A standard article (for example a standard D-plough share, if there were such a thing) could replace a similar standard article without alterations or adjustments, and without altering the working of the machine of which it is a part, because there would be no difference between them. The parts would be standard. Non-standard articles may appear to be the same, but they show discrepancies when it comes to fitting and using them.

Standardization is of interest to the farmer, in that it concerns the parts of machinery, particularly the wearing and replaceable parts, and not as a rule the assemblage of many parts into a composite whole. It is not concerned so much with cars, or tractors, or in this case ploughs in their entirety, as with plough feet and shares and plough seats; in short, with parts of ploughs. It is not concerned with cultivators, but with cultivator points; not with mowers, but with knife sections. To render such common parts truly common to all makes is one part of the task of standardization.

Standardization concerns not only the shape of things that are supposed to fit, but the quality of things as well. There are standards of milk, standards of "super.", f.a.q.'s in wheat, standard cement. There are standards of concrete-making, building construction, electrical wiring, boiler testing.

The advantages of having standards, especially for things that wear out and must be replaced quickly and easily, are these:

The consumer or buyer of the article knows what quality and size he is ordering and buying. For example, there is no need to stress the advantages of buying "super." to a clear standard, compared with buying, say, plough shares, when there is no standard. As a rule the consumer has his suspicions when he gets something below standard, but if there is no standard clearly set out for comparison, he can only suspect, without being certain.

A further advantage is gained by a reduction in the cost of production through the elimination of unnecessary sizes. Discs, for instance, would be much cheaper if the hundreds of different sizes at present in use were reduced to about 60.

On the other hand, it may be noted that when standardization comes into effect, though the cost of the standard article will in time be reduced, the price of the non-standard article will be increased to cover the cost of making it as a special article.

The Standards Association.

The work of introducing the policy of standardization into Australian industry and commerce is being done by the Standards Association of Australia, the national standardizing organization for the Commonwealth, which issues Australian standard specifications and codes. It is an independent body in the closest touch with industrial requirements and modern technical knowledge. Although it has the fullest recognition and support of Governments and private enterprise, it is free from governmental control.

Up to the present the Standards Association has made relatively slow progress in its attempt to bring a measure of standardization into the wearing parts of agricultural machinery. Standards for galvanized sheet, wire, barbed-wire and wire-netting have been published for some years, but although these affect the farmer closely they are not at all widely known.

Agricultural Machinery Committee.

The first work to attract the attention of the Association's Agricultural Machinery Committee (with Professor S. M. Wadham as chairman, and with representatives of primary producers as well as manufacturers among its members) was the question of plough feet. It was proposed to standardize first D-feet, then P-feet. On the face of it this would not be a long task, and yet the work is still incomplete at the end of three years.

Some small undertakings are nearing completion. Draft or final standards have been issued for cultivator points, knife sections for Australian mowers and binders, and sprocket chains. Items awaiting the work of other committees—American and Australian—are

threads for grease cups and nipples, also nuts and bolts for general use in agricultural machinery.

Two problems of some moment to the farmer are plough discs and pneumatic tyres. The multiplicity of discs is remarkable—and quite unnecessary. An attempt is being made to abolish a number of inconvenient sizes and to simplify the method of attachment. Pneumatic tyres for implements are becoming more popular. They materially reduce the draft of the implements, and are better than steel wheels for most purposes. But they will not be used as widely as they might if the farmer needs a separate set of tyres for each implement, which he uses for only a few days or weeks in the year. The problem would be readily solved by specifying a standard set of, say, four-wheel discs and tyres that could be easily attached to the various implements as they are required. Not all implements are capable of being treated in this way, but a surprising number would lend themselves to such a method, and there would be great economy in the use of pneumatic tyres if one set of wheels could be made to serve a whole farm.

Co-operation Necessary.

The strength and success of the Association's work on agricultural machinery depends on several things in which the primary producer must share. Unless he does so standardization will mean nothing to him, and bring him nothing. There can be no standardization, with its resulting economy, without his help. There must be co-operation between consumer and maker. Each must give way in some directions for their mutual benefit. The consumer may have to give up a desire for something different to meet his particular conditions, and the maker may have to forgo his opportunities in the manufacture of unstandardized spare parts.

The Association's work would progress more rapidly if primary producers made a stronger and more concerted demand for standardization in the machinery and equipment industry. It is curious that at present the makers are quicker to offer their co-operation than the primary producers are to ask for it.

When the consumer sees the need for standardization in a certain article, he should ask the Association to consider it. A concerted request for standardization along certain lines, made by a group or local society, is better still. In the meantime, consumers may be assured that unless they keep up pressure for more and more standardization, the interest shown by manufacturers at present is bound to decrease.

Further aid to the process of standardization would be rendered if the buyer demanded standard articles. When standard and non-standard articles are equally available, as they no doubt will be during the period of transition from the use of non-standard to standard articles, the movement will collapse for lack of support if consumers remain in ignorance of the standard articles, or refuse to use them, or neglect to ask for them.

General information on the use of standards, together with lists of Australian standards issued, may be obtained on application to the headquarters of the Standards Association, Science House, Gloucester and Essex streets, Sydney. The Association also has branch offices in all State capitals and at Newcastle, New South Wales. The address of the Melbourne office of the Standards Association is Temple Court, Collins-street, Melbourne, C.1.

THE NAVY BEAN—*(continued from page 495).*

have a beneficial effect on the physical structure and fertility of the soil, particularly if the plant debris from the threshing process is returned to the area on which the crop was produced. More attention to soil fertility is an outstanding need in Victoria, and the navy bean is the type of crop which will assist in rapid and profitable soil improvement. Its value in rotation with maize, flax, or sugar beet in those favoured parts of Victoria in which such crops are now grown should not be overlooked.

The use of Climatic Graphs in Determining Suitable Areas for Flax Production

by H. C. FORSTER, Ph.D., M.Agr.Sc., Senior Cereal Research Officer.

SUMMARY.

The very rapid expansion of the flax industry in Australia as a result of the war-time demand for flax fibre necessitated the inclusion of many new areas in the scheme. In order to determine those most suitable, climatic studies were made for a number of centres in Southern Australia. Graphs were prepared showing the progressive monthly values for available rainfall and temperature. Similar graphs were prepared also for those districts which had grown flax over the past three years, and on the basis of the crop behaviour at these centres tentative limits for length of growing season and temperature were obtained. The values so obtained were used to indicate the most suitable of the new areas for the cultivation of the crop.

BRITAIN'S war-time need of flax has resulted in a very rapid increase in the area devoted to its production in Australia. In the five-year period prior to the war, the area sown to flax climbed slowly from a few hundred to 2,000 acres in 1939, all of which was located in Victoria. In 1940, as a result of a special campaign, acreage was increased to 20,000 acres, most of which was situated in Victoria and Tasmania.

By the autumn of 1941, Britain's demand for flax fibre was so great that the Commonwealth Flax Production Committee planned that the area in that season should be increased if possible to some 60,000 acres. Such an unprecedented expansion of production necessitated the inclusion of many new areas in which there was little experience of growing flax, and in selecting these the officers concerned had to be guided largely by their previous experience in the normal flax areas.

Since flax, like oats, has a fairly wide tolerance as far as soils are concerned, the suitability of a given area for that crop depends largely on its climatic conditions, the factors of most importance being amount of available rainfall, length of growing season, and temperature. The relationship of climate to the cultivation of flax in the seasons and areas for which records are available should therefore be of value in indicating the potentialities of new areas for this crop. With this end in view the present study was made at the request of the Commonwealth Flax Production Committee.

Climatic graphs based on information supplied by the Commonwealth Meteorological Bureau have been prepared for the various districts to show the three factors of rainfall, length of growing season, and temperature. From an empirical study of the graphs from centres with known flax production records, certain tentative limits for successful growth were set and then used to indicate the possibilities of the new areas under consideration.

In regard to rainfall, while it has been usual in the past to study the total amount of rainfall during the growing season, various workers (3) have shown recently that evaporation of soil water must enter into any consideration of the amount of moisture available to the plants, and that, therefore, a more effective

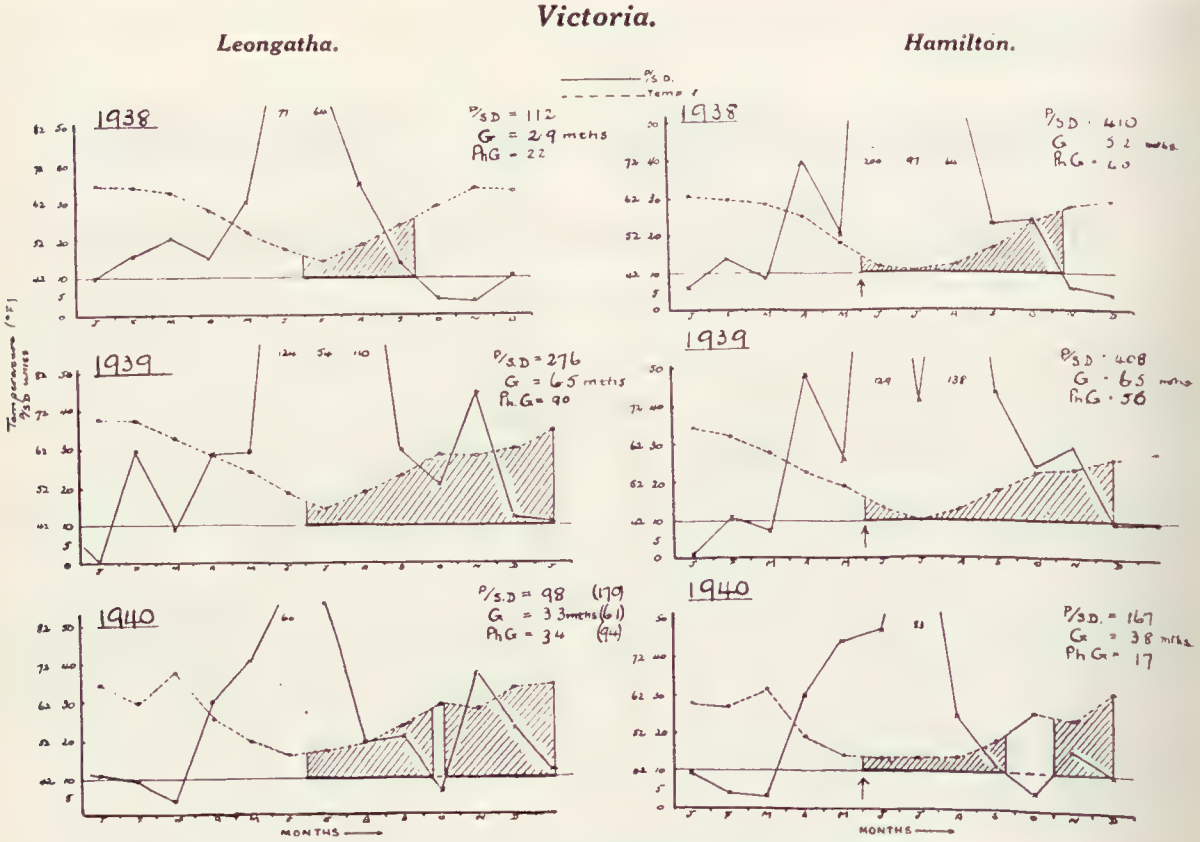


Fig. 1.—Climatic graphs for Leongatha and Hamilton districts.

measure of this factor at those periods when moisture is near the limiting point is given by the ratio P/E where P = total rainfall and E = evaporation. Evaporation is usually measured as the amount of water lost from a free water surface, but where the figures for this are not available, the saturation deficit (S.D.) as obtained from the meteorological readings of temperature and relative humidity may be applied. The latter ratio P/S.D. has been used in the present study.

Victorian observations have shown that the flax plant is very susceptible to dry periods at or near its heading stage. Once a check is received near this stage the crop rapidly comes into flower, thereby limiting further elongation of the stem so that as far as length of fibre is concerned, little use can be made of subsequent rains. It is apparent, therefore, that the length of the growing period from sowing until the available moisture in the soil is a limiting factor, is a vital consideration in successful flax production. The fixation of this end point in P/S.D. units is a matter of some difficulty. Trumble (4) has shown that a figure of P/E = ·3 (P/S.D. = 6·6) may be used to indicate termination of the growing season in South Australia, but considers that possibly a higher figure should apply in districts of lower evaporation. As will be shown later, actual observations made by Messrs W. J. McDonald, B.Agr.Sc., and A. A. Lee, B.Agr.Sc., on growing flax in the past seasons indicated that crops came into head at a time when the P/S.D. was approximately equal to a value of 10. Limiting values of 10 have, therefore, been taken for Victorian, Tasmanian and Southern New South Wales stations, and values of 7 for South Australian, Northern New South Wales and Western Australian districts.

A third climatic factor which will undoubtedly influence the length of flax fibre is temperature during the growing period. This will be of particular importance in comparing localities of such widely differing latitude as Leongatha in Victoria and Bunbury in Western Australia. In regard to the lower limits of temperature, field observations indicate that at Ballarat and Myrtleford growth is often at a standstill during

July, whereas at the other stations the crop does not appear to be so seriously affected. The lower limit for temperature has been set, therefore, at about 42°F, the average temperature reached by these stations in that month. When the temperature falls below this value, it has been assumed that growth is negligible or at best very slow, and the "length of growing" season has been reduced accordingly.

The graphs have been so constructed that the basal line of 10 (or 7) for P/S.D. coincides with the basal line for temperature of 42°F. The shaded portion on each graph (c.f. Fig. 1) which represents an area bounded on the base line by the "length-of-growing" period and on the upper limit by the line of the temperature graph should be a measure of the conditions of both moisture and temperature. If one assumes a linear relationship between the temperature above 42°F. and the rate of growth of the flax stem, the numerical measure of this area should serve therefore as an indication of both moisture and temperature. This measure has been termed the "Physiological Growth" (Ph.G.) factor and as will be shown later this has given a fair relationship to the actual behaviour of the crop, and has therefore been used in estimating the potentialities of new areas.

Little evidence can be found in the literature on the relationship of temperature to rate of growth as far as flax is concerned. As far as certain other biological processes are concerned, various relationships have been demonstrated from time to time. The "thermal summation" method as used by Livingstone and Shreve (2) in their survey of the distribution of American flora assumed a direct function between temperature and growth. The followers of Van't Hoff and Arrhenius, on the other hand, considered that an exponential relationship was more correct, while still others (1) have demonstrated that the function should be still more complex. Undoubtedly the particular relationship will vary from process to process and probably from plant to plant, and until more definite experimental evidence is available the use of the simple direct relationship appears justifiable.

Livingstone's "thermal summation" method did not meet with the complete success that

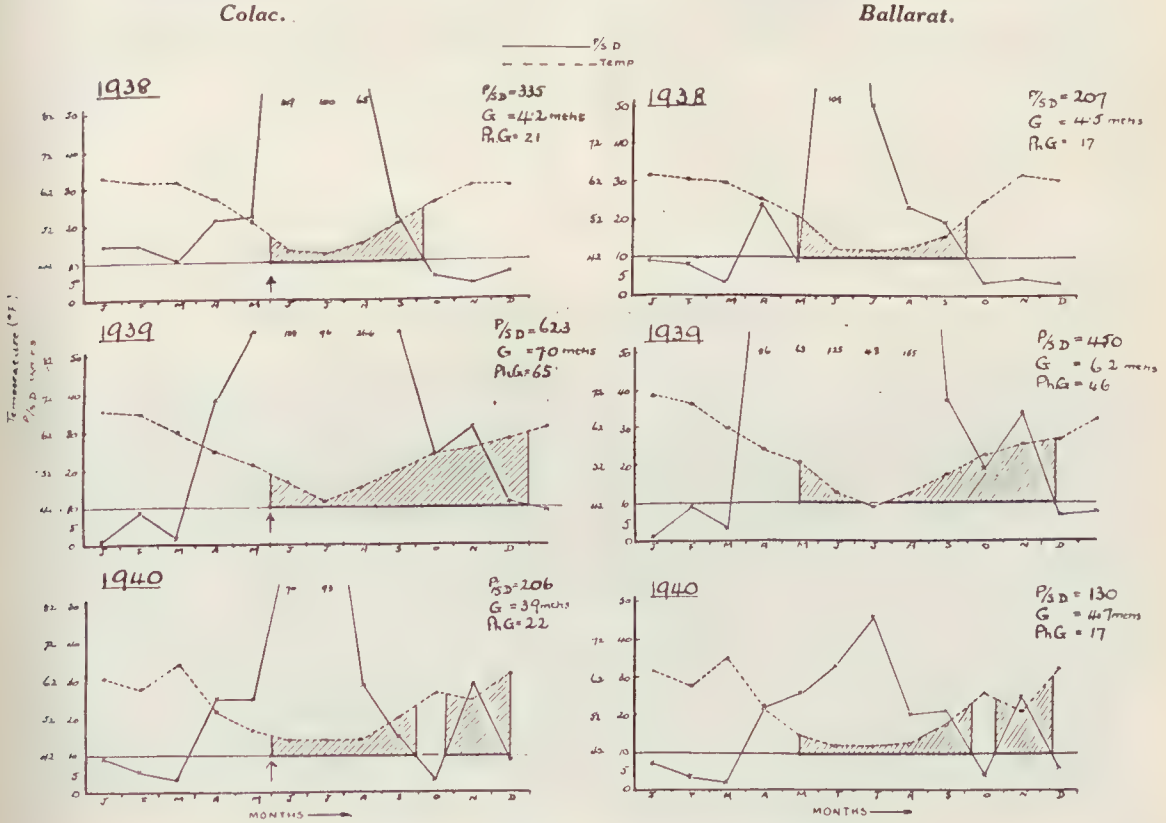


Fig. 2.—Climatic graphs for Colac and Ballarat districts.

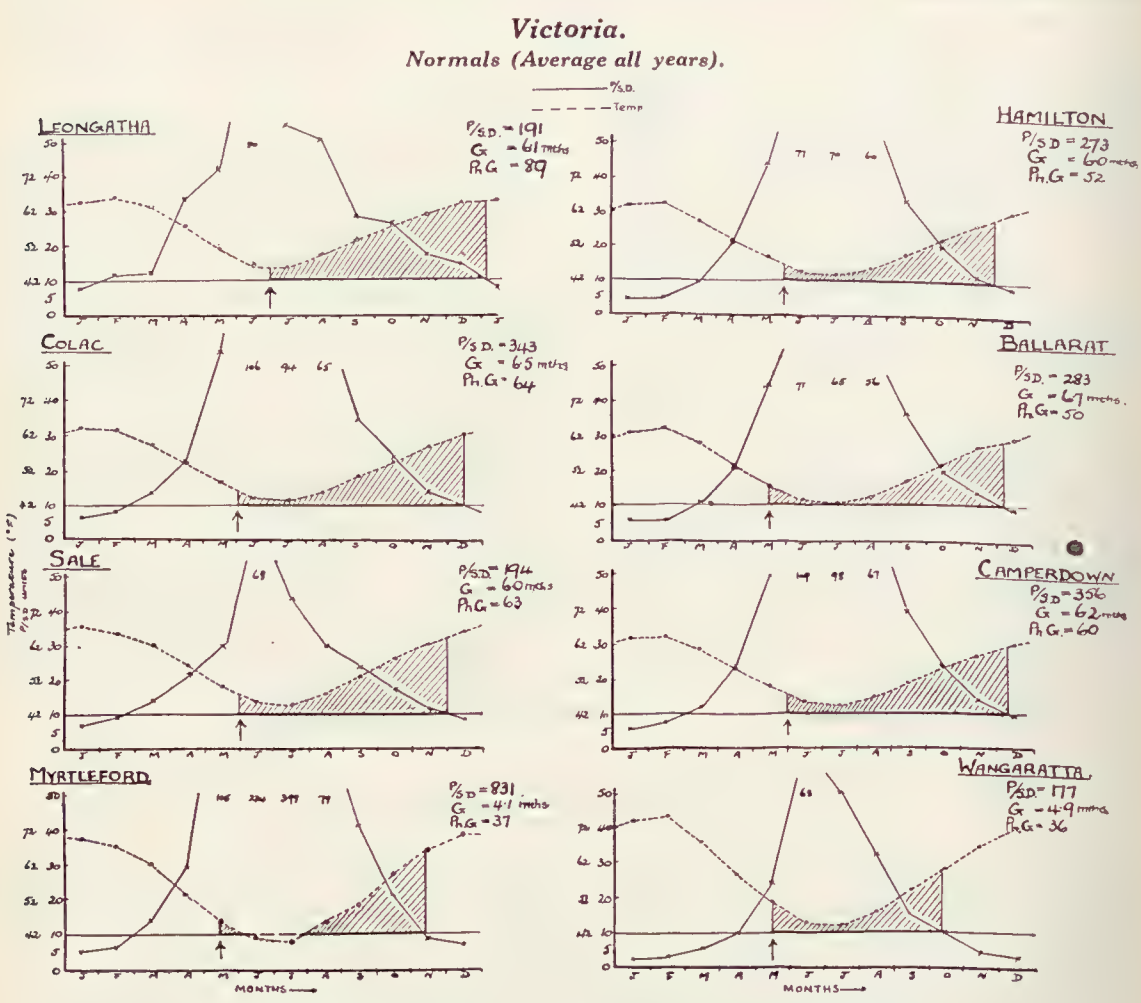


Fig. 3.—Climatic graphs for a number of Victorian Stations.

its authors hoped for it, as extreme variability in the results was occasionally found. Since temperature is only one factor concerned in growth, such might well be expected. In so far as the present "physiological growth" factor measures temperature only when moisture is also favorable, it may be expected to be an improvement on the previous method. Nevertheless, the fact that the many other factors influencing growth are not included in the relationship must limit the value of the present method and the graphs must therefore be regarded as suggestive only.

Flax Districts of Victoria.

Climatic graphs showing the mean monthly figures for P/S.D. and for mean 9.0-a.m. temperature for the years 1937–40 were first prepared for four Victorian stations, Leongatha, Hamilton, Colac and Ballarat, which grew commercial crops of flax in these years and which are recognized as good districts for flax production under normal climatic conditions. Figures of yield per acre for the variety Liral Crown are available from experimental plots in some of these districts and indicate the nature of the crop grown each year.

Both the seasons 1937 and 1939 were good years for flax. Rainfall was plentiful, and its incidence was, moreover, very satisfactory, and good yields were therefore obtained. The alternate years of 1938 and 1940 were, however, both drought years. Not only was the total fall low, but the spring rains failed badly. This was particularly the case during 1940,

when only light rains were received during the last half of September and most of October, and a number of crops shot prematurely into head and failed to produce a satisfactory length of straw.

Although the occurrence of two droughts in three years was disastrous from the production viewpoint, they were of considerable value in this study in defining the lower limits of rainfall and length of growing season for flax cultivation. The complete graphs for these two years together with that for 1939 as an example of a good year are accordingly reproduced in Figures 1 and 2. Time of seeding has been taken as early May for Colac, mid-May for Hamilton and Ballarat, and mid-June for Leongatha, the dates of germination being indicated by the arrows in the graphs. Rainfall and P/S.D. totals have been obtained for the growing season in each case and the figures together with those for "length of growing" season and "physiological growth" are given in Table I.

Also included in this table are the "Normals" (average all years) for the above four districts, together with those for four other districts which were considered possible new areas. The appropriate graphs are presented in Figure 3.

The graphs illustrate clearly the nature of the three seasons studied, the short sharp season in 1938 with complete absence of late spring rains, the long wet season in 1939, and the dry September–October period of 1940 which forced the Liral Crown crops to a premature heading. Reference will be made later to the effects of the subsequent late rains in November and December. The justification of the choice of the figure of P/S.D. = 10 as the lower limit of growth is well illustrated in the 1940 graphs, where it may be noticed

TABLE 1.—CLIMATIC FACTORS FOR VARIOUS DISTRICTS IN VICTORIA.

	Rainfall for Season*	P/S.D. for Growth Period.	Growth Period (G) Months.	Physiological Growth deg. mths. [G x (T–42)].	Crop Yield† and Behaviour.
	ins.				cwt./ac.
Leongatha—					
1938 ..	15·4	112	2·9	22	22 Low crops
1939 ..	32·9	276	6·5	90	.. High yields
1940 ..	23·1	98	3·3	34	.. Short crop
Hamilton—					
1938 ..	13·9	410	5·2	40	41 Medium yields
1939 ..	23·5	408	6·5	56	60 High yields
1940 ..	12·9	167	3·8	17	20 Low yields
Colac—					
1938 ..	12·6	335	4·2	21	19 Low yields
1939 ..	27·5	623	7·0	65	45 Good yields
1940 ..	13·2	206	3·9	22	10 Crop failed
Ballarat—					
1938 ..	12·0	207	4·5	19	13 Poor crop
1939 ..	25·1	450	6·2	46	32 Medium yields
1940 ..	13·6	130	4·7	16	.. Crop failed
Normals—					
Leongatha	25·6	191	6·1	89	..
Hamilton ..	19·1	273	6·0	52	..
Colac ..	19·5	343	6·5	64	..
Ballarat ..	18·6	283	6·7	50	..
Sale ..	14·3	194	6·0	63	..
Camperdown	20·5	356	6·2	60	..
Myrtleford	24·3	831	4·1	37	..
Wangaratta	16·8	177	4·9	36	..

* Includes period from one month prior to seeding to harvest.
† Yield from Experimental Plots (Liral Crown).

A fine crop of "Concurrent" flax in the stook, Leongatha district.

that had the South Australian value of seven been used for the Victorian districts, no appreciable break in the season could have been demonstrated.

From the figures in Table 1, it can be seen that while total rainfall and total P/S.D. do not necessarily give a very good correlation with crop behaviour, the figures for "growth" period and for "physiological growth" come much nearer the mark. For instance, at Hamilton, although practically the same rainfall was received in 1938 and 1939, the longer growing period of 1·3 months of the latter year was responsible for an increase of nearly 1 ton per acre in the crop.

Limits that might be set on the basis of these graphs for the growth of flax in Victoria in any one season would appear to be in the region of 4·5 months growing period and a value of about 35 for Ph.G. In determining the general suitability of a district over a period of years, however, the average "normal" figures and graphs with correspondingly higher limits must be used. These might be set tentatively at about five months' growing period and a value of 40 for "physiological growth".

In considering new areas, it can be seen that the two districts around Camperdown and Sale would have a good prospect of being suited to flax culture, the former district in particular having better prospects than Hamilton. Success in the Sale district will vary more with the season experienced. Although the rainfall is spread over a long season, it is rather light, and the growth of the crop will be affected adversely by dry spells. In considering such aspects, the shape of the rainfall graph is of material value. Districts with a low flat curve will generally be more liable to abnormal dry spells than those with a sharply peaked curve.

The North-eastern districts around Myrtleford and Wangaratta approach more closely to the limits. The latter with the finish of the season in mid-October must, on the average, expect a number of seasons with early spells of dry weather in which the flax crop will not reach the desired length. Myrtleford, on the other hand, has a better rainfall with the season lasting until mid-November, but the low temperatures of mid-July should retard growth materially during the winter. The arable land in this district, situated as it is along the river valley, will, however, receive a considerable amount of seepage from the adjacent hills. This will be equivalent to extending the season by two to three weeks, and will undoubtedly enable the flax to mature satisfactorily in many seasons when it might otherwise be expected to fail if dependent only on rainfall.

These observations on the situation at Myrtleford stress the importance of regarding the tentative limits set above as approximate broad limits only. A number of extentuating circumstances such as seepage, fallowing, or aspect of the land may increase available moisture or raise temperatures and thereby affect the likelihood of producing satisfactory crops.

Flax Production in Other States.

Tasmania.

The climatic graphs of Tasmanian localities (Figure 4 and Table 2) of which Launceston is given as an example, are very similar to those of the best parts of Southern Victoria. Despite a considerable increase in latitude, winter temperatures are not as low as in parts of Victoria due to the proximity of the general flax areas in Tasmania to the coast. With the rainfall lasting on the average well into December, the season is sufficiently long to enable crops sown in August or even later to mature satisfactorily in most seasons.

TABLE II.—CLIMATIC FACTORS FOR VARIOUS DISTRICTS IN SOUTH AUSTRALIA AND TASMANIA.

—	Rainfall for season*	P/S.D. for Growth Period.	Growth Period (G) Months.	Physiological Growth deg. mths. [G × (T−42)]	Crop Behaviour.
	ins.				
South Australia—					
1940—					
Waite Institute ..	10·1	69	4·0	47	Good crops
Mt. Barker ..	14·3	127	4·3	32	Good crops
Meadows ..	17·6	..	..	..	
Normals—					
Waite Institute ..	17·3	129	5·3	71	
Mt. Barker ..	24·2	240	5·6	60	
Millicent ..	22·9	291	6·0	69	
Clare	17·2	204	5·3	48	
Kapunda	13·4	126	5·0	52	
Tasmania—					
Launceston ..	19·6	245	5·5	57	

* Includes period from one month prior to seeding to harvest.

South Australia.

In South Australia, the situation is more difficult to define. Not only are there fewer actual cases of the successful cultivation of commercial areas of flax from which to judge, but the climate is materially different from that in Victoria. While rainfall in the late spring is lighter and the growing season therefore shorter, temperatures during the winter are higher, and these compensate for the quicker

South Australia and Tasmania.

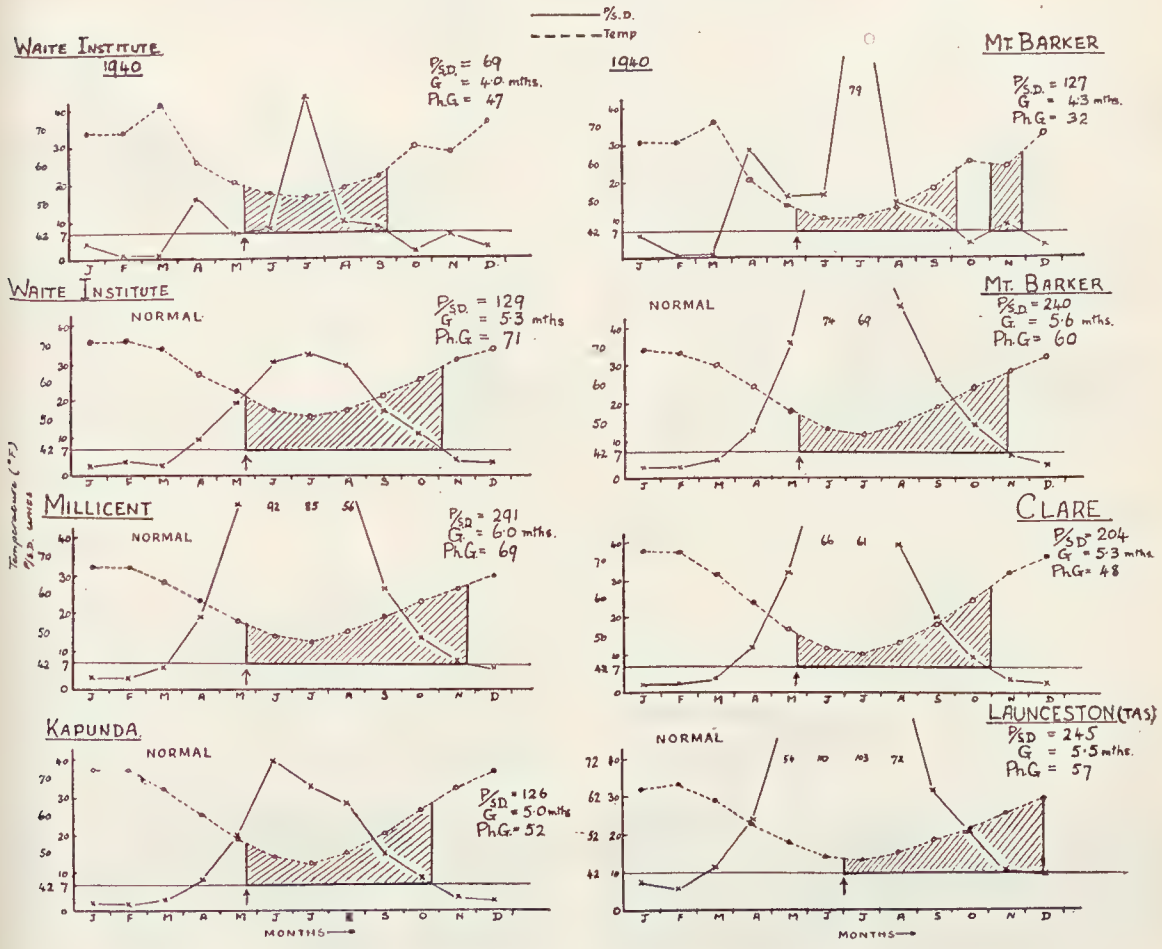


Fig. 4.—Climatic graphs for a number of stations in South Australia and Tasmania.

finish. The figures for P/S.D. and for temperature have been obtained as in the case of Victoria except that the limiting value of P/S.D. has been taken as seven. As most of the flax, except in the south, is likely to be sown on fallow in South Australia, seeding is generally earlier and the middle of May has been taken as a sowing date, with the crops germinating about the last week in May.

The figures and graphs for South Australia are presented in Table 2 and Figure 4. No data on temperature or relative humidity are available for Meadows, the nearest station being Mt. Barker, whose rainfall, however, is 5 inches less.

With regard to the estimation of the figures for "length-of-growing" season, lack of observations on growing flax crops (except at the Waite Institute) prevent the setting of limits on the basis of actual experience as was done in Victoria.

The figure of 4·2 months for "growth period" for the good crop at the Waite Institute in 1940 would indicate, however, that with the higher winter temperatures, the limit for "growth period" can be reduced to a value below 4·0. The "physiological growth" figure, because it combines both temperature and growth period, should be more constant, and the figure of 50 for the Waite agrees fairly well with the figures for the good crops in Victoria. Similarly the figure for the good 1940 crop at Meadows should be well above the Mt. Barker value and should agree with the limits set for Victoria.

In considering other areas in South Australia, the foothills around the base and in the Lofty Ranges would appear satisfactory, the lower temperatures of the hills as compared with the Waite Institute being compensated by a longer growing season. The Mount Gambier–Millicent district will also be well suited to flax cultivation.

On the average figures, much of the Kapunda–Riverton–Auburn–Clare districts would appear worthy of trial. Rainfall at Kapunda itself, with only 126 P/S.D. units on the average, is light, and there will be a number of seasons when an early dry spell will prove unfavorable. However, rainfall in most of these South Australian districts varies within very small distances, e.g., Adelaide 21·17 inches, Waite Institute 25·11 inches, Mt. Barker 31·07 inches, and Meadows 35·86 inches (all within about 25 miles), and this prevents any general recommendations as to districts as a whole. Provided care is taken to select the higher areas with the better rainfall, and provided most of the crop is sown early on well prepared fallow, successful crops should be grown in normal years.

Table III.—Climatic Factors for Various Districts in Western Australia and New South Wales.

—	Rainfall for Season.*	P/S.D. for Growth Period.	Growth Period (G) Months.	Physiological Growth deg. mths. [G x (T–42)]	Crop Behaviour.
	ins.				
Western Australia—					
1940—					
Bunbury ..	10·8	36	2·8	47	Good crop
Normals—					
Bunbury ..	30·1	208	5·3	84	..
Katanning ..	14·4	216	5·1	52	..
York ..	14·6	179	4·5	52	..
New South Wales—					
Normals—					
Cootamundra	14·6	305	3·6	29	..
Culcairn ..	14·6	191	4·8	33	..
Albury ..	18·7	254	5·3	39	..

* Includes period from one month prior to seeding to harvest.

Western Australia.

The values for the Western Australian districts are presented in Table 3 and Figure 5. The limits for temperature and P/S.D. used are the same as for South Australia.

A very satisfactory crop was grown in the Bunbury district in 1940 on the surprisingly short growing season of only three months. Owing to the late arrival of the seed from England, the flax could not be sown until the end of July. With the high temperatures experienced throughout the winter in this district (the July average of 54°F. being 10 degrees higher than that experienced in Victoria), growth was very rapid and by the end of October when the dry season set in, the crop averaged from 30 to 36 inches in height. When it is considered that some workers (5) have estimated that for every 18°F. rise in temperature, rate of growth is doubled, it can be seen that the three-months growing season at Bunbury may well be equal to five months in Victoria.

The "normal" graph for Bunbury gives with a May sowing the very high value of 84 for the "physiological growth" factor. If satisfactory crops of 30-in. height were grown in 1940 on an August planting, it would appear likely that with a May sowing in a normal year the crops would be very rank, and lodging might be a problem.

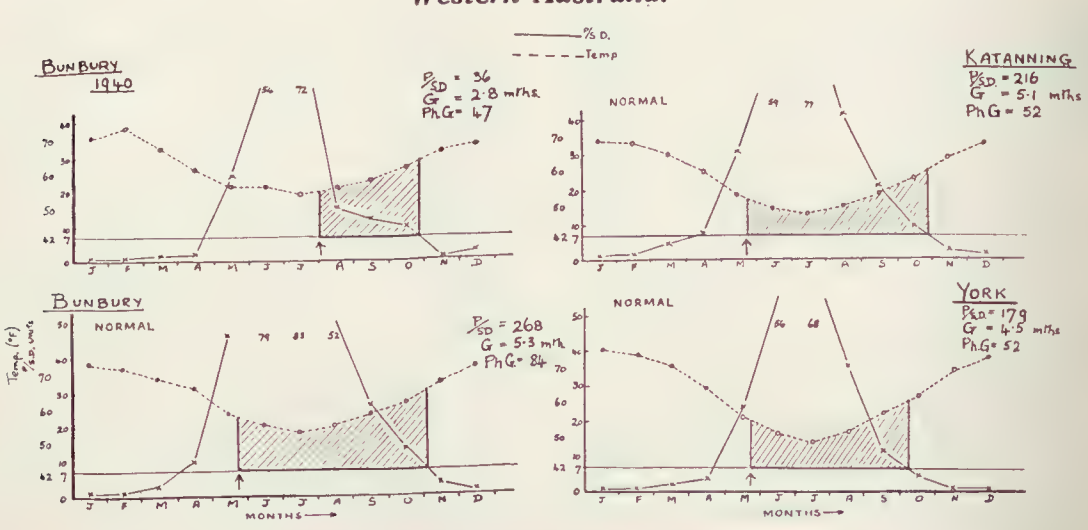


Fig. 5.—Climatic graphs for several Western Australian stations.

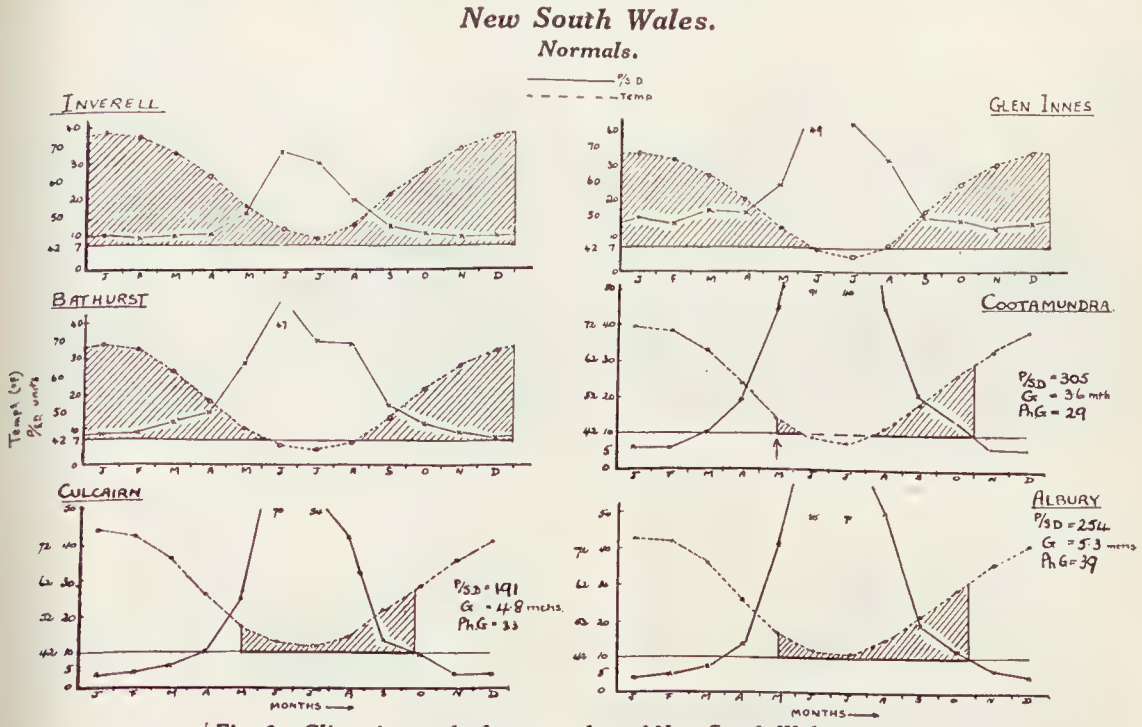


Fig. 6.—Climatic graphs for a number of New South Wales stations.

The figures and graphs for Katanning show a close similarity to those for Clare in South Australia, and indicate the possibilities of the former district as a new area in Western Australia. The general occupation of cereal farming in this locality should simplify the mechanical problems of sowing and harvesting the flax that have proved difficult in some of the areas explored so far. The graphs for York and Northam show a decided peak in the rainfall and the season ends rather sharply at the beginning of October. If an early sowing can be obtained on fallow, satisfactory crops may be harvested with normal rains, but there will doubtless be many seasons in which rainfall will be too light at the end of the season.

New South Wales.

The graphs and figures for the New South Wales districts are presented in Figure 6 and Table 3. The limits of P/S.D. and temperature as used for South Australia were taken as base lines for the northern part of the State, while for the southern portion, which more closely resembles the typical winter rainfall belt of northern Victoria, the limits as used for that State were taken.

The northern higher rainfall districts of New South Wales, in contrast to the Victorian stations, have a definite summer incidence in the rainfall. Despite the higher temperatures during the summer and consequent greater evaporation, soil moisture is sufficient to maintain growth throughout this period, and the type of graph is therefore entirely different from that of the normal flax districts in the southern States. Figures for the various constants used would therefore not be comparable and accordingly are not given in Table 3.

The graphs for Inverell, Glen Innes and Bathurst illustrate these points. Although conditions of temperature and moisture will permit of excellent growth, difficulties would possibly be experienced in the harvesting and curing of the straw. A more serious difficulty to the introduction of flax to these areas is likely to be the probability that the replacement of the profitable summer cereals and pastures which are so suited to this climate by a crop, such as flax, will be hopelessly uneconomical.

For the southern portion of the State, Cootamundra, Culcairn and Albury have been taken as examples. Using the base limits as used for Victoria, it can be seen in Figure 5 that the season finishes fairly early on the

average. This fact, combined with the low temperatures experienced in the winter, results in fairly low values for the "physiological growth" figure. The remarks that applied to Wangaratta in Victoria will apply therefore equally to the Cootamundra and Culcairn districts. Albury, with a longer growing season and higher rainfall, should have better prospects, although even here there are likely to be many seasons which are too short for the successful cultivation of flax.

Discussion.

The suitability from a climatic point of view of a given district for the cultivation of flax is naturally only one aspect to be considered in this matter of seeking new areas. The nature of the soil, conditions for treatment of the straw and site of the mill, and costs of carting straw, are all points that must be considered. Furthermore, it must be stressed that the climatic conditions as indicated by the meteorological readings may not always reflect the true conditions in the soils on which the crops are grown (cf. the remarks on Myrtleford).

Relationship of P/S.D. Limits and Stage of Growth.—Reference has been made in the opening remarks to the effect of the September–October dry spell in 1940 in forcing the Liral Crown variety of flax to an earlier maturity than it would normally have had. The experience of the crops grown at Leongatha in that year throws an interesting light on the relationship of variety to the effect of that dry spell. Much of the seed imported from England in that year was Concurrent, a variety some two to three weeks later, which was therefore at a much younger stage of development when the dry spell came. Because of this it was not forced into ear at that time and lasted in an immature condition until the November rains fell, when it went ahead and produced a very satisfactory crop. (The figures in brackets in the graph for that year represent the values for the extra period.) In no district in Victoria did Liral Crown bridge the dry spell that year.

It is evident, then, that though a given P/S.D. value sufficiently low to result in a check to growth may force a fairly well advanced crop into head, an alternative crop sown later or seeded to a later-maturing variety may not be so affected, and therefore may be in a position to benefit by later rains. This factor will undoubtedly be of importance in certain years in districts with no definite break between the wet and dry seasons (as in southern Victoria), but in those areas with a sharp finish to the season (as in most of South Australia and Western Australia), early sowing and early maturing varieties should be preferable.

Time of Seeding.—Under normal cultivation practices in Victoria, the ground is usually ploughed and prepared just prior to sowing so that a month or six weeks normally intervenes between the first "break" of the season and seeding. Where the introduction of flax into cereal districts is contemplated, the position may be different in that the flax can be sown on fallowed land. Seeding may therefore take place much sooner after the first autumn rains and a valuable early start to the crop be obtained. This factor, combined with the additional moisture conserved in the fallow, should enable the crop to be grown successfully in districts of lighter rainfall and lower "physiological growth" value than would be the case in southern Victoria.

The graphs should be of material use in indicating optimum times of seeding in different districts. For instance, in those districts whose season is short, it is obvious that if weeds are not a problem, early sowing will be advantageous. In areas with cold winters such as Myrtleford or Ballarat, efforts should be made to get the crop well established before the winter sets in, so that every advantage can be taken of the warmer temperatures and moist soils in the spring. In districts with a long growing season such as Gippsland or Tasmania, sowing can be left appreciably later, the approximate time being gauged by estimating the necessary length of time from the date when the P/S.D. line falls below 10.

Quality of the Fibre.—No mention has been made so far as to the quality of the fibre produced by the various districts, and in this regard little information is available from past experience either in this country or overseas. It might be expected on the basis of botanical evidence that with very rapid growth, cells may be large, and cell walls correspondingly thinner, whereas with slower growth over a longer period, cells would be smaller, greater in number, and possessed of thicker cell walls. If this be the case the fibre produced in the high-temperature districts even though of the requisite length may not compare favorably in quality with that from the more southern areas.

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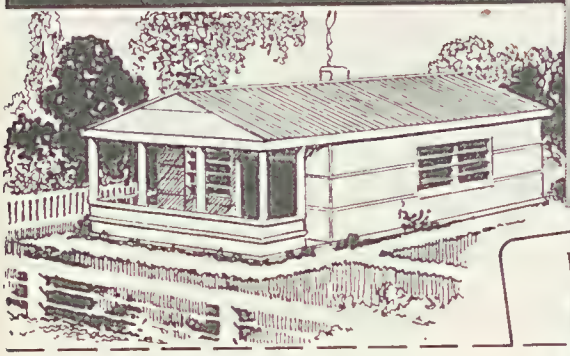

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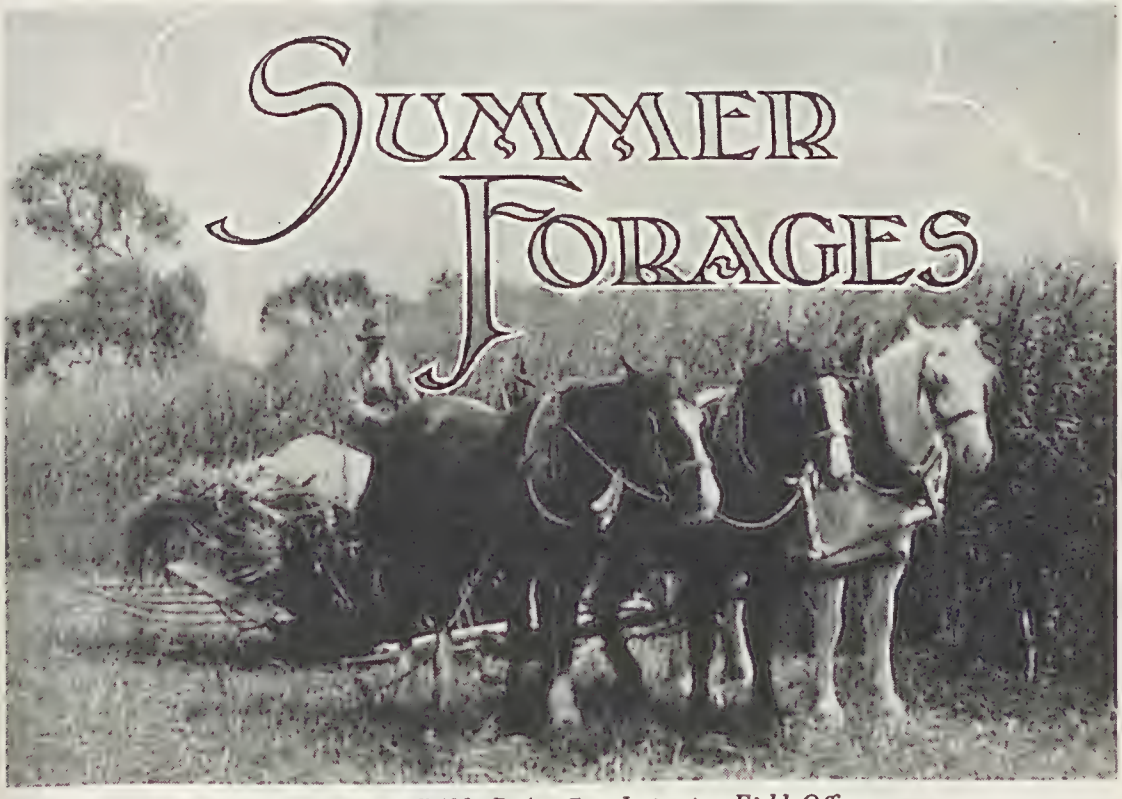
Summer Forages



By A. MORGAN, B.Agr.Sc., Irrigation Field Officer

LUCERNE and permanent pastures of summer-growing perennial clovers and grasses are the most valuable summer forages, but the term "summer forages," as commonly used, is restricted to summer-growing, annual species, such as sorghums millets, and maize.

For best results with these crops summer rains or irrigation are required, and consequently their popularity is greatest in the higher rainfall areas of Victoria, and in the northern irrigation districts. In both areas they are slowly but surely being replaced by permanent crops, and in the older and more closely settled areas under irrigation, they have in some cases practically disappeared, except for special uses (such as preliminary cropping of partially-graded land, or as a stage in the reclaiming of salt-affected areas). In Gippsland, where Japanese millet used to be favoured as summer feed for dairy cows, the establishment of permanent pasture has been superseding the annual crop.

It is clear then, that on both non-irrigated and irrigated farms the production of summer forages is, in many cases, a stage of development

Harvesting millet in the Kerang district.

rather than a desirable permanent routine. When the mass of greenstuff which these fodders produce is viewed at its most attractive and most bulky stage, it might be wondered why they are recommended to play only a transitory role in land utilization. The answers to this are found in their annual character, the restrictions which often have to be made in feeding them off, the work involved in preparing fresh ground for them each season, the securing of satisfactory strikes, and the waste involved in grazing them. A fuller appreciation of these disadvantages will be gained from the detailed accounts given later in this article.

Maize-growing is generally regarded as a subject separate from sorghum and millet production, and is not discussed in this article. Maize has proved valuable for other purposes besides green feed, and some districts in high rainfall areas have specialized in its production, but this development has not been paralleled in northern irrigation districts.

In text books, such as Maiden's *Grasses and Fodder Plants of New South Wales*, a great variety of summer forages is described and illustrated, but in Victoria very few of these are grown in quantity, and it is safe to say that the only important ones are Japanese millet, Sudan grass, ambercane, saccaline, and imphee.

Japanese Millet.

After "natural" pasture or subterranean clover has dried off, a quick-growing and palatable feed is necessary to continue producing cream, to cater for carry-over of lambs, to top off backward and late lambs, to supplement dry rations for ewes, and so on. In the irrigation districts, when a dry season appears likely to continue, there is an added incentive to profit from the difficulties of the dry farmer. In these districts a paddock which is thoroughly dried off can be harrowed or cultivated, especially where the soil has a crumbly surface, and 10 to 15 lb. per acre of millet seed can be "combined," drilled, or broadcast—whatever the method used, the sowing is practically on the surface when dry sowing is done. The amount of superphosphate used varies from none up to 100 lb. per acre, and, generally speaking, the insufficient manurings commonly employed do not arrest exhaustion of the soil and should not be encouraged. However, the growers maintain that they can see very little result from the superphosphate, quite forgetting the fact that paddocks which have grown a few crops of millet, especially in the shallower soils, develop heavy growths of weeds that flourish in land of low fertility, such as "chamomile" (Lemon beauty-heads, *Calocephalus citreus*) under irrigation conditions.

Watering follows as soon as possible, and provided reasonably calm and hot weather occurs, a good "strike" will be secured. In windy weather a second watering may be required in a week, especially on plain ground, as this type of soil dries out rapidly after an irrigation, sometimes caking and cracking to a depth of 2 inches. The second "quick" watering enables the plants to establish roots below this dried surface layer, and from then on, depending on the weather, waterings may be required as often as once a fortnight for best results. On heavier ground, which takes 3 or 4 inches of water when graded, less frequent watering will be satisfactory, but it is an inescapable fact that Japanese millet is not a cheap crop to grow as far as water (which has to be paid for) is concerned.

If grown under rainfall, the choice of time of sowing will be governed by the season, and in most cases some favorable location such as a creek flat will be selected, whereas under irrigation, sowing is usually commenced before

the end of October, but is continued into November. In the early days some northern farmers made a practice of soaking the seed to germinate it before sowing, but nowadays it is more usual to sow dry seed mixed with the superphosphate, either putting it well down into watered ground or on the surface of dry ground. On properly-graded land, sowing after watering is to be preferred.

Grazing can be commenced as soon as enough growth is showing to make it worth while turning the stock in. In this regard, sheep grazing can be commenced earlier than cow grazing. On some soils very early grazing with sheep appears to be practised with the idea of mulching the surface, which tends to crack and dry out quickly after a watering. A rotation of watering and grazing is then usually followed out, and if short feed is offering at each grazing it is of good quality. On ungraded land the growth is usually patchy, and if subdivision is not practised the stock tend to concentrate on the less vigorous patches.

While a succession of feedings from short growths of millet is the best practice, a common procedure with sheep is to save some paddocks until they are at an advanced stage of heading, and, if rain has not fallen in sufficient amount to start winter-annual pastures, stock may be kept on a paddock until it is eaten out. A heavy wastage occurs with this system, as a good deal of leaf and seed is trampled into the ground. Paddocks saved for seed are ready for harvest from the end of February, and a travelling header may work through a limited district on a contract basis.

These seed crops are normally early-sown, not later than the middle of October. Seed from late sowings is likely to be soft because of unsettled or cool ripening weather. Yields around 18 cwt. per acre are good, and the product averages 1 cwt. per bag. Seed production, because of weather conditions in February-March, is practically confined to the north of this State, and except for small importations from Queensland the northern harvest is sufficient to supply the demands of the north-east, Gippsland, and the irrigation districts. Queensland prices largely influence Victorian prices, as the former seed can be brought to Victoria for about 25s. per ton, including freight and other charges. Good seed is bright in colour, and should be hard—this is usually tested by crushing the seed with a penknife on a hard, flat surface. Signs of mould should be looked for, and the content of weed seeds and rubbish should be low. The regulations of the Seeds Act allow 3 per cent (by weight) of inert matter, which may include 1 per cent. of some weed seeds. No other crop seeds are allowed to be present, and the percentage of non-germinable seeds allowed is 25 per cent. In practice the germination is 90 per cent. and over, if good seed is sown under suitable conditions. An average sample has approximately 135,000 seed per lb.

Sudan Grass.

Sowings of Sudan grass are usually made after millet sowing has been completed. Thus, while the Japanese millet is being utilized, the Sudan grass is allowed to grow through to an advanced stage of maturity, and, if water supply is restricted, its resistance to dry conditions is utilized to the best advantage by reserving it for grazing in the late summer. With this plant there is a risk of prussic acid poisoning, but, considering the acreage grown and the fact that it is sometimes grazed at an immature stage without loss, this risk does not appear to be great. However, both from the stand-point of danger from poisoning and possibility of obtaining the most pasture, Sudan grass should usually not be grazed until

Stripping Japanese millet seed with a header harvester.

Sudan grass cut for hay at Benjeroop.

it has reached a height of from 18 inches to 2 feet. With many green fodders, if stock are turned in in poor condition and hungry, there is a grave risk of mortality from bloat which is not associated with the formation of prussic acid, and in the case of Sudan grass a reasonable precaution is to avoid such a combination of circumstances. Under irrigation conditions both sheep and cows have been observed in numerous instances to be grazing on Sudan grass in all stages of growth without ill-effect, so that, while not dismissing the possibility of poisoning, it is suggested that undue importance is sometimes placed on this feature.

Sowing practices for Sudan grass are similar to those described for Japanese millet, and under favourable conditions good germinations are obtained. Complaints are frequently made about the poor "strikes" obtained, however, and there are several possible causes, apart from the fact that the seed is more likely than Japanese millet to heat if bagged permanently, too soon after harvesting. The later sowing, under northern conditions, means that it is more difficult to keep the soil sufficiently moist while the roots become established. More trouble is met with in dry seasons when this factor is more potent, and obviously the practice of sowing on dry ground aggravates the trouble. If sown in a good seed-bed after an irrigation, and on graded land there should be no difficulty in getting a good crop. Another factor is that over-watering or rather water-logging causes patchy results when the sowing is made on rough ground. The summer forages can tolerate a high degree of water-logging when they are able to keep some leaves above water, but the seed and the seedling suffer from excess water as much as from lack of moisture.

Under ideal conditions for growth (ie., warm soil, calm and hot weather, adequate soil moisture) the plants can be ready for use, either for cutting or for grazing, within two months after germination, and where irrigation is available it is possible to get three or perhaps four grazings during the season. After the first grazing the stalks remaining can be mowed, and a watering or two, depending on the type of soil, will produce further growth, which is in most cases more satisfactory in bulk than that obtained from Japanese millet similarly treated. Paddocks properly managed can be kept going until April, possibly into May, and are not influenced by frosts to the same extent as Japanese millet. Sudan grass may grow as high as 8 feet, and may yield up to 3 tons of hay per acre, but there is some difficulty in handling material of this length with a binder. Crops up to 4 feet high can be handled with a stripper or header, if seed is to be harvested straight from the crop, and it is preferable to deal with crops which have been fed off or cut at the first growth, owing to the unevenness in length and maturity stage of the stools in the first crop. The uneven ripening necessitates care in drying the product before being permanently bagged up, as heating induces mould and reduced germinability. Seed threshed from hay is less liable to be affected in this way. The seed yield commonly reaches five or six bags per acre, the bags being heavier than with Japanese millet (about 150 lb. compared with 112 lb.).

Sudan grass hybridizes easily with other members of the sorghum group, and the hybrid plants, which are distinguished by their broad

leaves, thick stems, and shorter, more compact heads, have been shown to contain a higher percentage of the substances known as glucosides, which, when eaten by stock, produce the poisonous prussic acid.

By allowing the crop to come well out in head before grazing is begun, the risk due to the presence of these plants in a Sudan grass paddock is eliminated, but such a paddock is not satisfactory for seed-saving.

In lower rainfall areas, light seedings (3-4 lb. per acre) are desirable to accommodate the population of plants to the moisture supply, and by blocking off alternate runs of the drill a spaced sowing can be obtained which helps materially.

Ambercane, Saccaline, and Imphee.

Sowings of amber cane, saccaline, and imphee are made at rates varying from 10 lb. to 20 lb. per acre. On properties where a continuous supply of green feed is required, as in dairying, the planting of ambercane is usually, through necessity, deferred until the sowing of the Japanese millet and/or Sudan grass is finished, and it may be January before it is put in, and in irrigation districts is given its first watering if sown in a dry seed-bed. As with the millet, however, early sowing, commencing any time after the middle of October, is likely to give the best results. For the sheep man, especially if he has a reasonable area of subterranean clover, the main value of these fodders is in the autumn when rainfall is poor, and although the coarser sorghums are not as satisfactory for sheep grazing as millet and Sudan grass they produce a great bulk of fattening feed, and can be utilized to great advantage if a system of cutting and chaffing and feeding-out can be practised. The later the time of sowing, the more necessary it is to put in an early maturing type, and the ambercane is then more satisfactory than the saccaline. Saccaline lasts longer into the winter, however, and this consideration may be important to the grower. Farmers who are not particular about the time at which they will secure the maximum grazing are inclined to under-value the saccaline, because its growth is so noticeably slower than that of ambercane.

Of the crops dealt with, these afford the greatest risk of poisoning from prussic acid, but even so, as long as they have not suffered any check to growth because of dryness, and providing stock are in good condition and used to green feed when turned in, it seems that crops in an early stage of growth can be fed off without losses of sheep or cattle.

Ambercane and similar crops, because of their bulk, are unsuitable for hay making, and the harvesting of seed involves a great deal of hand labour. Small areas are usually selected, and the heads taken off by cutting with a sharp knife. The heads are dried and later threshed. A "bench" is often made

A crop of Sorghum under irrigation at Swan Hill.

by bending down the stalks in adjacent rows and overlapping them, and the heads are laid out in this during the cutting; this method is even more useful for harvesting broom millet. As only the best heads are taken off, the yield of seed per acre is not as reliable a figure as with Japanese millet and Sudan grass, but a fair result is three bags per acre, at about 170 lb. per bag. Early sowing is advisable for seed crops of all species, to avoid bad weather for harvesting and ripening. Saccaline seeds average around 27,000 per lb., and the ambercane and imphee average 23,000. Laboratory germinations usually exceed 90 per cent., but some samples of ambercane are slow in germinating. Self-sown crops of millet, &c., often provide some grazing in the season following that of sowing, but are never worth the trouble of protection.

Good and Bad Qualities.

The outstanding qualities, good and bad, of these crops can be summed up as follow:—

Japanese Millet.

Advantages.—Quick and early growth, complete safety in grazing at any stage (providing stock are not ravenously hungry when turned in), high palatability to both sheep and dairy cows when kept short, and cheapness of the seed. It can be easily and cheaply harvested for hay, and, in the north, can be utilized for seed production.

Disadvantages.—Poor resistance to dry conditions (this is comparative), poor resistance to frost, rapid loss of palatability towards maturity (this applies more to sheep than to cows), and the possibility of introduction of "wild millet" (*Echinochloa crus-galli*) with dirty seed.

Sudan Grass.

Advantages.—Quick and early growth, pronounced resistance to dry conditions, easily and cheaply harvested for seed and for hay (although hay is not of good quality in comparison with cereal hay).

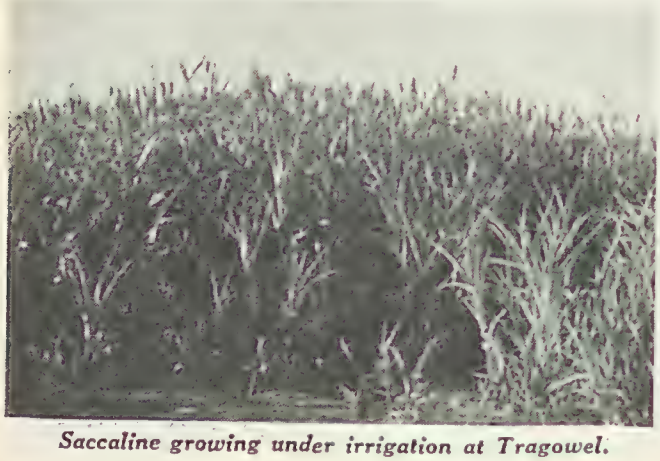
Disadvantages.—Risk of poisoning of stock (this is more fully discussed later), rapid loss of palatability with maturity (this applies to both cows and sheep).

Ambercane, Saccaline, and Imphee.

Advantages.—Bulky production, retention of palatability to an advanced stage of maturity, medium resistance to dry conditions, lateness (lasts after frosts).

Disadvantages.—Lateness (not available for grazing until February, usually), no distribution of grazing periods except through subdivision, or by cutting and feeding out, expensive and laborious to harvest for seed, unsuitable to handle as hay, difficult to handle for ensilage.

As the above-mentioned plants are grown primarily for grazing or for seed, and reserves of better quality fodder can be made from cereals, lucerne, Wimmera rye grass, or perennial rye grass with subterranean clover, &c., it might be wondered why any mention is made of the relative ease of harvesting them for hay. One reason is that in the northern irrigation districts a monsoonal rain in February may change the whole outlook with regard to feed conditions, and sheep may be quickly transferred to "natural" pastures in adjoining unirrigated districts. The summer forages are then required no longer as green feed, and agistment profits disappear. When this occurs it is likely that an effort will be made to conserve the excess, if plant and labour are available, or some sections may be reserved for seed. With Japanese millet and Sudan grass, seed can be taken off with a stripper or header if the crops are not too tall, or they can be cut with a binder and stacked or stooked for threshing, or a mower and rake can be used. These implements usually are useless to deal with ambercane and saccaline. Sorghums make good silage.



Saccaline growing under irrigation at Tragowel.

Victorian Potato Stabilization Plan

Potato Growers Materially Assisted

By J. M. WARD, Chairman, Victorian Potato Committee

THE bountiful rain at the end of January produced a record crop of potatoes, and a Departmental survey indicated that the total yield in Victoria would be 257,000 tons. The average annual consumption of potatoes in this State is approximately 120,000 tons, while shipments to other States varied from 15,000 tons to 20,000 tons per year. After due allowance for seed and stock food a surplus of 90,000 tons of potatoes in Victoria was indicated.

It appeared to be impossible to market this surplus, but an organized plan to prevent glutting of the market and arrange for the usual quantity of potatoes used for human consumption in Victoria to be sold at a payable price was essential. This was asked for by the Victorian Potato Growers' Association, and by meetings of growers in various parts of the State.

On the 29th July, 1941, regulations which had been approved by the Victorian State Advisory War Council consisting of representatives of the United Australia Party, the Labour Party, and the Country Party, were gazetted, under which the Victorian Potato Committee was constituted.

The Committee commenced to function immediately, and realizing that a proportion of the abnormal potato crop could not be marketed irrespective of how cheaply they were sold, it decided to regulate supplies to meet the demand, and thus enable the growers to obtain a payable price for the part of their crop which could be sold in Victoria. The Commonwealth Prices Commissioner fixed "a maximum price" of £6 per ton f.o.r. Melbourne for No. 1 Grade potatoes. Some growers do not yet realize that a "minimum price" was not fixed by the Prices Commissioner.

Victoria's consumption of table potatoes was 120,000 tons per annum, or approximately 2,000 tons per week, and this quantity had to be allotted each week among 3,000 growers. To allot each grower a weekly quota would have resulted in a very small issue to each producer. In practice it was found that about 750, and occasionally 1,000 growers, could be allotted a quota for each weekly period. But by equitable adjustment every grower was allotted his fair proportion of his crop. On two occasions, allocations of quotas were held up for a few days until stocks carried over from the previous week were cleared.

Prior to the plan coming into operation the average price paid to growers for No. 1 Grade potatoes at country railway stations was 37s. 6d. per ton. The Victorian Potato Committee, by regulating supplies, with the co-operation of the trade, succeeded in maintaining the "maximum price" of £6 per ton at Melbourne. As a result of stabilizing the price in Victoria, potatoes for interstate markets immediately rose 10s. to 20s. per ton, and recently rose another £1 per ton.

The difference between the 37s. 6d. per ton on the open market in July and the £6 per ton on the stabilized market attained by the Committee in August, plus the increased return for potatoes sold interstate, meant that Victorian potato growers received for their potatoes an extra £70,000 since the plan came into operation which they would not have received if the price had not been fixed and the supply regulated by the Committee.

If the stabilization plan had not been adopted, the market would continue to be glutted, and the potatoes would have been sold for 30s. per ton at country stations, and many potato growers would have been ruined because that price would meet only the cost of bags and digging, and leave nothing for the grower.

Prior to the adoption of the plan, many growers had decided that they would not dig all their potatoes. But when the price improved growers resumed digging, and many of them wanted to rush all their crop on to the market and receive the £6 per ton, and disappointment was felt by some growers who could not receive a bigger quota than was allotted to them. The Committee would have liked to increase the quotas of every grower, but to do so would have thrown about 3,000 or 4,000 tons on to the market every week, which would have caused an over-supplied market and collapsed prices again. Market limitations compelled the Committee to continue allotting weekly quotas of sealed potatoes to the growers for sale in Victoria.

From 2nd August to date, quotas have been allotted by the Committee for 20,000 tons. To identify "quota" potatoes, every bag of No. 1 Grade potatoes supplied by growers under the stabilization plan is sealed by putting a wire through the mouth of the bag. This wire is fastened with a lead seal, and clamped by an inspector of the Department of Agriculture with a pair of pliers that impresses thereon "D.A." (Department of Agriculture). The regulations provided that unsealed potatoes cannot be legally sold for human consumption in Victoria.

The Committee does not buy or sell potatoes. Growers and merchants conduct sales in the usual manner, conditionally upon their selling only potatoes in sealed bags—with the exception of seed potatoes (maximum fixed price £9 per ton), stock food potatoes (25s. per ton), and potatoes for export to another State. These do not have to be sealed, nor are such sales subject to the allotment of "quotas" by the Committee.

Potatoes other than "sealed" or "seed" or "stock food" potatoes cannot be sold in Victoria at more than 10s. per ton, which is the maximum price fixed by the Prices Commissioner for "other potatoes."

Market gardeners in the metropolitan areas produce a crop of potatoes termed "autumn" potatoes. The seed is planted in January and February, and the small, immature potatoes when dug are washed and sold in fruit cases throughout the winter and spring as "new" potatoes, although they are not really new potatoes. The Vegetable Growers' Association discussed the sale of these small washed potatoes with the Committee and desired to sell them as "new potatoes" at 6s. to 8s. per case. The Committee was unable to grant their request because these potatoes did not comply with No. 1 Grade Standard under the *Fruit and Vegetables Act* 1928, and also because the maximum price for table potatoes had been fixed by the Prices Commissioner at £6 per ton and all potatoes sold for human consumption in Victoria had to be sold at or below that price, and in sealed bags.

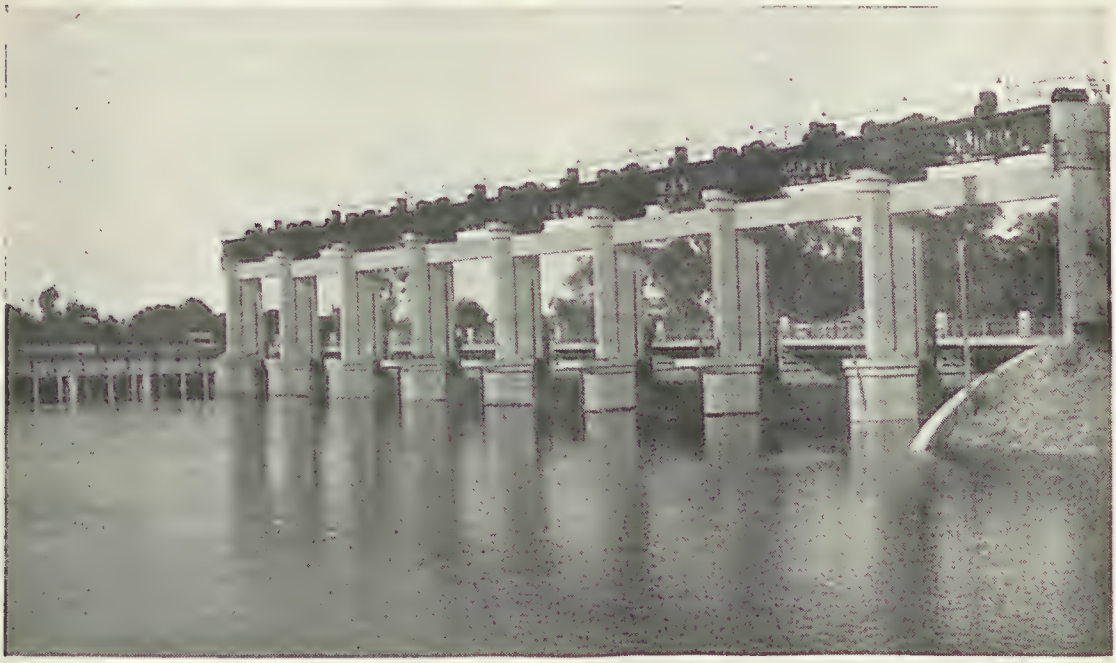
No. 1 Grade potatoes have to conform to the following standard:—

> "Potatoes described as No. 1 Grade shall consist of sound potatoes of similar varietal characteristics having regard to colour, shape, and general appearance, well shaped, practically free from insect or fungus disease, or damage caused by mechanical means or blemishes, including second growth, frost, sunburn, greening through exposure, sprouting or other injury or deterioration, and practically free from dirt or other foreign matter. They shall have a mature skin and shall be not less than 2¼ inches in diameter or less than 3 ounces in weight."

The marketing of genuine "new" or "spring" potatoes was recently discussed with the Vegetable Growers' Association, and the Committee agreed to their request to allow the sale of new season's potatoes on and after the 1st of November. The regulations under the *Fruit and Vegetables Act* 1928 provide that "new" potatoes can be sold in Victoria after the 1st of November, but all growers of these potatoes should comply with the Commonwealth and State laws, and until the Prices Commissioner amends the declared maximum price, new potatoes cannot be sold at a higher price than £6 10s. per ton wholesale for Carmens and £6 for any other variety.

Potatoes described as "New Potato Grade" must comply with the standard of No. 1 Grade, except as to maturity and size. They need not have a mature skin and shall be not less than 1¾ inches in diameter.

Notwithstanding the disadvantage of not commencing to function until August, when half the season was over, it should be apparent to every reasonable person that the Potato Stabilization Plan has been an outstanding success and a great benefit to the potato growers of Victoria.



The diversion weir at Yarrawonga, an important feature of the Murray Valley irrigation system.

IRRIGATED PASTURES IN THE NORTH OF VICTORIA

By G. B. Rayner B.Agr.Sc., Assistant Agrostologist.

IN this article dealing with the plots situated in the irrigation areas in the north of Victoria, a certain amount of repetition of general remarks made in previous articles on the irrigated pasture tests at Maffra and in the Goulburn Valley, published recently in this *Journal,* is unavoidable. This is mainly due to the fact that irrigated pastures can be grown under a fairly wide range of soil and climatic conditions, and some aspects of their care and maintenance will apply to all districts. The plots with which this report deals are situated at Cohuna and Swan Hill on the properties of Mr. G. Major and Mr. A. Douglas respectively. They consist of manurial and species establishment trials on soils not affected by salt (that is they are distinct from other plots in the area concerned with the reclamation of salt-affected land), and form part of the scheme of investigational work made practicable by the help given to the Department by the Victorian Pasture Improvement League.

Perennial pasture, annual pasture, and lucerne each plays a part in the utilization of the irrigable areas in the north of Victoria. The first experimental plots conducted by the Department of Agriculture in the district were concerned with the growing of lucerne, but in recent years this crop has been largely replaced by pasture, and the investigational work has been changed accordingly. It has been amply demonstrated that the area is capable of growing highly productive pastures of either annual or perennial species. This latter type has been developed on the plots, and is dealt with in this report.

The experimental area at Swan Hill was sown in 1935, one section being devoted to a species establishment trial, and the remainder sown with a mixture of grasses and clovers for later use as a manurial trial. The site was ploughed in October, 1934, and again in January, 1935; cultivations during the summer and the early autumn, and a watering during the first week of April, produced a firm and comparatively clean seed-bed with good moisture conditions, and sowing was carried out on 30th April, 1935, and 1st May, 1935. On the species section, six legumes (lucerne, perennial red clover, alsike clover, New Zealand white clover, strawberry clover, and subterranean clover) and nine grasses (tall fescue, meadow foxtail, Timothy grass, prairie grass, cocksfoot, Kentucky blue grass, South Island New Zealand rye grass, Colac perennial rye grass, and Hawke's Bay perennial rye grass) were sown in strips at right angles to one another, and an area of about ⅔ acre was sown with a mixture of Phalaris tuberosa and subterranean clover. A particularly dry winter followed sowing, and the early development of the plots was very disappointing, as only a partial germination occurred. Heavy rain in July induced a further germination, and by the spring a good establishment of the legumes —except strawberry clover, and particularly lucerne—had been obtained. The rye grasses had made excellent growth, Phalaris tuberosa and prairie grass were conspicuous, cocksfoot, Kentucky blue grass and tall fescue were fairly well represented, while meadow foxtail and Timothy grass were poor. The Phalaris tuberosa and subterranean clover plot was particularly attractive, but it soon became apparent that the Phalaris was rather unpalatable to the stock.

During the second year, the relative adaptability of the different species to the area became apparent. The certified perennial rye grasses had formed the best sward. They proved to be superior to the ordinary commercial strain. Cocksfoot, tall fescue, and Phalaris tuberosa were developing very well, but meadow foxtail, Timothy, and Kentucky blue grass were unsatisfactory. The tall fescue had not then assumed a tussocky habit of growth and appeared to be relished by the stock. All the legumes, except strawberry clover, were good; with red clover particularly conspicuous.

The most noteworthy feature during subsequent years has been the spread of white clover over the whole area. This species is now the most important legume in the sward. Alsike clover and lucerne have thinned out; and although strawberry clover has increased, it is still only a minor element in the pasture. An unusual feature has been the persistence of the red clover. This was the most conspicuous legume during the first four or five years, and it still contributes a great deal to the production of the pasture. Phalaris tuberosa and subterranean clover provide the most feed during the winter months. Although there has been no quantitative work on this section of the plots, it is considered that the production of this mixture over the whole year would not be as great as that of a mixture of perennial rye grass and white clover. The tall fescue plot has become very rank and tussocky, and is entirely neglected by the stock.

It would appear from this test that white clover, red clover, perennial rye grass, and cocksfoot are the four species which are best adapted to local conditions from the points of view of persistence, production and palatability. These four species are growing very well on the manurial section of the plots where a complete mixture was sown. Strawberry clover, alsike clover, and lucerne may have a place in a pasture mixture for this district, but the sowing of tall fescue, Kentucky blue grass, Timothy grass, and meadow foxtail is not recommended.

The manurial section of the plots was sown at the same time as the species section with a uniform dressing of 92 lb. superphosphate per acre. The following autumn differentially manured strips were superimposed on this part of the paddock, and these treatments have been repeated in each of the succeeding years. The response of lucerne to heavy applications of superphosphate had been demonstrated locally by earlier plots, so the new test included dressings of superphosphate up to 6 cwt. per acre in order that the possibilities of this manure on irrigated pastures in the district could be investigated. The measurement of the yield of the plots by cutting with a motor lawn mower was commenced in June, 1938, when the plots were divided into two sections to be mowed and grazed for alternate periods of two years. The results from the first two years are given in the accompanying table.

IRRIGATED PASTURE PLOTS ON THE PROPERTY OF MR. A. DOUGLAS, SWAN HILL.

Average of Results for Two Seasons (1938-39 and 1939-40).

Manurial Treatment per Acre per Annum.	Cwt. Dry Matter per Acre. Mean of Four Replicates).	Increase over No Manure.
No manure	54·1	..
Super. 1 cwt.	57·3	3·2
Super. 2 cwt.	63·2	9·1
Super. 3 cwt.	76·9	22·8
Super. 4 cwt.	79·7	25·6
Super. 6 cwt.	80·1	26·0
Super. 2 cwt. + amm. sulph. 1 cwt.	62·8	8·7
Super. 2 cwt. + pot. sulph. 1 cwt.	67·1	13·0
Super. 2 cwt. + amm. sulph. 1 cwt. + pot. sulph. 1 cwt.	63·3	9·2
Super. 2 cwt. + lime 10 cwt. ..	78·5	24·4
Super. 2 cwt. + gypsum 10 cwt. ..	64·8	10·7
Super. 2 cwt. + amm. sulph. 1 cwt. + lime 10 cwt.	68·3	14·2

It will be seen that although the highest yield was obtained from the application of 6 cwt. of superphosphate, 4 cwt. was apparently the limit of profitable application of that manure under the prevailing conditions. Of the soil amendments and manures used in combination with 2 cwt. of superphosphate, lime alone gave a significant increase. However, this increase is not sufficiently big to warrant the recommendation of liming as a profitable enterprise for the district, as the application of extra superphosphate provides a cheaper way of increasing production.

The Swan Hill plots are watered frequently during the summer. The average interval between waterings for the whole season is usually less than a fortnight, and during the hot weather the plots are often watered every week. It is under such conditions of ample moisture that a response to heavy dressings of superphosphate is to be expected, because the amount of manure a pasture can profitably use is dependent, within limits, on the rate and frequency with which the pasture is watered. It is also true that the efficiency of a watering system, which can be expressed by the production per unit of water per unit area, is progressively increased by the application of increasing amounts of superphosphate. These two factors—liberal manuring and adequate watering—contribute more than any others to the success of an irrigated pasture; but one is not much good without the other.

The plots at Cohuna also have been well watered, and here too increases in yield have been obtained with dressings of superphosphate up to 4 cwt. per acre. At Cohuna no benefit was derived from the application

Irrigation structures on the main Yarrawonga channel. A subsidiary channel is shown on the left, and a farm take-off with Dethridge meter, at right.

of lime, gypsum, potash, or ammonium sulphate, in addition to 2 cwt. of superphosphate, and the response to bone fertilizer was not as great as to superphosphate. Autumn is the usual time to top-dress, but a common practice is to apply an additional dressing in the spring. The efficiency of this method was tried out on the plots by making one treatment 4 cwt. applied in the autumn, and another 2 cwt. in the autumn, plus 2 cwt. in the spring. Far from increasing the yield, the dividing of the annual dressing into two lots was associated with a marked decrease in yield. In similar tests elsewhere it made no difference how the annual quota of manure was divided up, and there appears to be no reason why the division of 4 cwt. into two applications should have depressed the yield at Cohuna. After the first two years of measurement the mowing and the grazing sections were changed over, and the results so far show no appreciable difference between the two 4 cwt. treatments on the other half of the plots.

The tests at Cohuna and Swan Hill indicate that for irrigated pastures in the north of the State, as in other districts, superphosphate is the best manure; and the only manure that it is worth while to apply in addition to superphosphate is more superphosphate.

IRRIGATED PASTURE PLOTS ON THE PROPERTY OF G. MAJOR, COHUNA.

Average of Results for Two Seasons
(1938-39 *and* 1939-40).

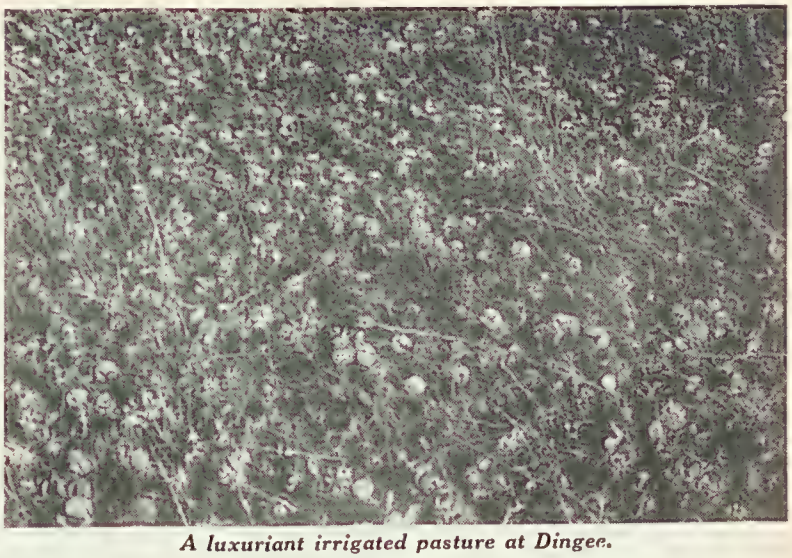
Manurial Treatment per Acre per Annum.	Cwt. Dry Matter per Acre. Mean of Three Replicates).	Increase over No Manure.
No manure	77·4	..
Super. 1 cwt.	80·9	3·5
Super. 2 cwt.	89·9	12·5
Super. 4 cwt.	105·0	27·6
Super. 4 cwt. (two applications) ..	92·2	14·8
Super. 2 cwt. per annum + lime 1 ton every five years	87·1	9·7
Super. 2 cwt. per annum + gypsum 1 ton every five years	88·5	11·1
Super. 2 cwt + pot. sulph. 1 cwt. ..	86·8	9·4
Bone fertilizer 2 cwt.	85·5	8·1

The Cohuna plots were established in 1933 on the site of a former lucerne trial which was ploughed up and fallowed for a time before sowing the pasture seed. In irrigation districts, a thinned-out lucerne stand is frequently changed over to a perennial pasture. Although it was desirable to fallow the area before sowing the experimental plots, and the formation of a good seed-bed is generally conceded to be a necessary preliminary to pasture establishment, when pasture is to follow lucerne it is not always essential to plough up the stand. Provided the grading is satisfactory and the check banks are in reasonably good order, the loss of grazing occasioned by fallowing can be avoided by surface sowing the pasture on the thinning lucerne stand. An effective establishment can usually be obtained by lightly scarifying the area and mixing some pasture seed with the manure at the time of top-dressing. Ten pounds of perennial rye grass, 5 lb. of cocksfoot, and 2 lb. of white clover should provide the basis for a good pasture to take the place of the lucerne when it has finally died out.

On the portion of the paddock devoted to a species trial, strips of perennial rye grass by itself, and then with each of the following grasses in turn, Italian rye grass, cocksfoot, Timothy grass, meadow, foxtail, Phalaris tuberosa, and Kentucky blue grass were sown across the bays, which were separately sown with subterranean clover, strawberry clover, alsike clover, white clover, and a mixture of clovers, including perennial red clover. Perennial rye grass and white clover made the most vigorous growth of all these species. The establishment of the other grasses was fairly good, but cocksfoot was the only one to persist. Phalaris tuberosa and Kentucky blue grass did well for a time, whereas Timothy and meadow foxtail were always sparse. These four have now practically disappeared from the sward. The clovers other than white made moderate development during the first two or three years, but strawberry clover alone has survived. A complete mixture of the above grasses and clovers was sown on the manurial section of the plots, and here there has developed a well-balanced sward of perennial rye grass and white clover, with cocksfoot and strawberry clover also represented.

The experiments outlined above have shown that superphosphate, water, perennial rye grass, and white clover are four essentials to high production of a perennial pasture. However, the growth thus encouraged is not uniform throughout the year. It reaches its peak in the spring, is well sustained during the

summer, and falls to a very low ebb in the winter. The farmer therefore must do something to reconcile this fluctuating supply to a fairly constant demand. During winter scarcity there are three things which can be done with the stock; let them go hungry, get rid of some of them either by sale or agistment, or feed them. The first possibility, apart from humanitarian considerations, would generally be uneconomical, so the farmer will probably choose between the other two courses of action. Regulating the stocking according to the growth of the pasture seems, at first sight, to be the obvious remedy; and in the case of lambing ewes it can be done to a certain extent by arranging for lambing to commence just before the spring flush of growth. But most irrigation areas are devoted chiefly to dairying, and it is necessary to maintain a herd throughout the year, which means that the cows must be fed during the winter. The question then arises; on what are they to be fed? Feeding may be of two kinds; either on the pasture itself, that is by altering the pasture system on the farm, or supplementary feeding. The first method involves the growing of special kinds of pasturage for each season of the year. For example, Phalaris tuberosa and subterranean clover for the winter and early spring, and perennial rye grass and white clover for the late spring and summer. This will even out the production curve to a degree, but the winter production still will be considerably below that of the spring, and some form of supplementary feeding will be required. For this purpose, crops such as oats and maize can be grown for conserving and feeding out, or meadow hay or silage can be made from the pasture itself by cutting some of the surplus growth in the spring to be preserved for the lean period. The second method should be the chief type of fodder conservation on a dairy farm. If the pasture will not give sufficient growth in the spring to permit the storage of adequate fodder reserves, it is an indication that some factor such as watering or manuring is being neglected.



A luxuriant irrigated pasture at Dingee.

Meadow hay is cut at the stage when the grass has flowered and is beginning to form seed, whereas silage can be cut about a fortnight before this. If the excess pasturage is conserved in both forms, it allows harvesting operations to be spread over a longer period. A portion of the farm should be shut up for hay and/or silage each year, but the same paddocks should not be cut in successive years, as repeated hay cutting may cause a deterioration in the quality of the pasture. The paddocks to be conserved are shut up in August or September, and harvested in November, with the result that the stock have to be carried temporarily on a reduced area. However, the extra growth means that the stock can remain longer on each grazing paddock, and the length of the recuperation period allowed the pasture between successive grazings can therefore be maintained. It has been stated earlier that the production from an irrigated pasture is well sustained during the summer months. This fact may tempt a farmer to continue grazing his herd on a restricted area after the spring cuts of hay have been made, and to cut some more hay in the summer so that he will have a surplus to sell, or to take a flock of sheep on agistment, or to buy a flock for fattening. Such action is usually short-sighted, because during the summer the pasture should be given the opportunity to build up reserves—both above and below the ground—for the following winter. This will benefit both the grazing animals and the sward.

Furthermore, some of the soils in the northern irrigation areas have a tendency to crack when they dry rapidly after watering, and the retention of a good cover during the hot weather will help to bind the soil and minimize the surface cracking. The maintenance of a cover of pasture will also reduce the loss of water by evaporation from the surface of the soil, and thereby effect a definite economy.

It is important to avoid over-grazing at all times of the year, because if the animals are allowed to remain too long on a paddock they will eat some plants right out, and the bare space thus created will afford weeds and inferior species an opportunity to become established. It will be found that a system of rotational grazing whereby each section of the pasture is grazed in turn judiciously, and allowed a recuperation period of about one month between successive grazings, will retain the valuable species in the pasture, and will combine a high production with a well-balanced diet for the stock.

Weeds in Irrigated Pastures

Both annual and perennial weeds may be troublesome in perennial irrigated pastures, but the former are usually of sporadic occurrence only. Such annuals as barley grass and pepper cress can gain entrance after a period of drought or over-grazing. They become prevalent more readily when the pasture has been weakened by insufficient manuring, and are soon suppressed by the vigorous growth of white clover which is induced by careful pasture management.

The perennial weeds fall into two groups—erect-growing plants such as chicory, nut grass, spear thistle and rushes; and prostrate, creeping or rosette types, of which hogweed, flatweed and red mallow are examples. These latter types become numerous only when a pasture is allowed to deteriorate in vigour.

The taller weeds are aided by neglectful grazing management. Pasture should not be allowed to become too long and should be eaten off as thoroughly as practicable at each grazing. Otherwise tussocks may develop, which are left untouched by the stock, being unpalatable, and in these weeds can persist. Topping with the mower is of great value in developing an even sward. The pasture, if it is dense enough, can then hold its own.

Special measures taken against perennial weeds at regular intervals do much to prevent their spread. Spear thistle and rushes are suppressed by hoeing. Docks and chicory may be pulled out while the ground is still soft after a watering. On a small irrigated farm such action is usually practicable, particularly where, by liberal topdressing with superphosphate and careful watering treatment, a dense pasture with abundant white clover is established, allowing only a few weeds to gain entry in the first place.

Conserving Soil Potash

Experiments show that the potassium content of many Victorian soils is low. Potassium is an element absolutely necessary in the growth of plants, and where the produce is removed continuously and no potassic fertilizer is applied the productivity of such areas will drop away very considerably.

Potassic fertilizers will be practically unobtainable until after the war and even in peace time their cost is so high that farmers will do well to make the best use of the potash at present in their soils.

Fortunately animals do not require potash in their tissues to the same extent as plants, and a great percentage of the potash of the fodder passes through the animal body and is returned to the soil—the greater part being in the urine.

The conservation and utilization of animal manure is therefore of extreme importance, not so much in the immediate sense but for future years when the growth will depend on whether the farm potash is all deposited round the cowshed or spread evenly over the paddocks.

Don't wait until the pastures become unproductive—utilize the potash at your disposal now.

Budding, Grafting, and Methods of Re-working Fruit Trees

By

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Previous instalments of this article appeared in the July, August, September, and October issues of the Journal

WOUNDS IN FRUIT TREES—THE BRIDGE GRAFT.

WHEN one or two-year-old trees are severely ringbarked by rabbits or implements, and their subsequent growth is affected, they should be cut back to a few inches above the bud or graft union, and one new shoot allowed to grow and form the stem. If the ringing occurs at or below the union, or if older trees (three to five years) are injured, they should be cut off below the injury and whip-tongue, bark- or cleft-grafted in the spring.

When the trunk or branches of older trees are injured severely, it may be many years before the wound is covered by callus, and special steps must be taken to save the tree. Large wounds should be trimmed smooth and protected, as soon as they occur, by the application of a white lead and linseed oil paint. This prevents the wounded tissue from drying and cracking, and reduces the risk of fungal infection. They should then be bridge-grafted, a form of tree surgery which should be more extensively practised by Victorian fruit growers.

"Bridge-grafting" is the term used to describe the operation of inserting scions to "bridge" wounds. It is essentially a replacement of injured or removed tissue. The scions function as part of the conducting tissue of the tree, and their future growth covers the wounds and provides protection from wood-decaying fungi. The actual scions increase in diameter, but do not elongate, nor do they ultimately produce fruit as in other forms of grafting. The graft can be performed at any time of the year when the bark can be separated easily from the wood.

Preparation of the Stock.

The edges of the wound should be trimmed by cutting away torn tissue, and the exposed wood should be painted as recommended above. If a diseased area, e.g., collar rot of citrus trees, is being treated, it should be thoroughly cleansed and a margin of healthy bark at least an inch wide should be removed from around the wound to ensure that no trace of the fungus remains.

Two parallel, longitudinal cuts, the width of the scion apart and about 1½ inches in length, are made in the upper edge of the bark about an inch from the side of the wound, and deeply enough to penetrate to the underlying wood (Fig. "*a*"). Two similar cuts are then made in the lower edge of the bark at the base of the wound directly under the cuts in the upper edge of bark. The narrow flap of bark is raised by inserting a ¼-inch chisel, or a thin knife blade, between the wood and the bark. If the wound is wide, additional pairs of cuts, spaced about 2 inches apart, should be made.

Preparation of the Scion.

The scion wood is similar to that used in other forms of grafting. Sometimes, however, bridge grafting is performed later in the growing season when dormant scion wood is unavailable. Wood of the previous season's growth, from which the leaves have been removed, is then used.

The scion is cut about 2 inches longer than the wound, and the base and tip are cut to a long wedge with the longer cuts on the same

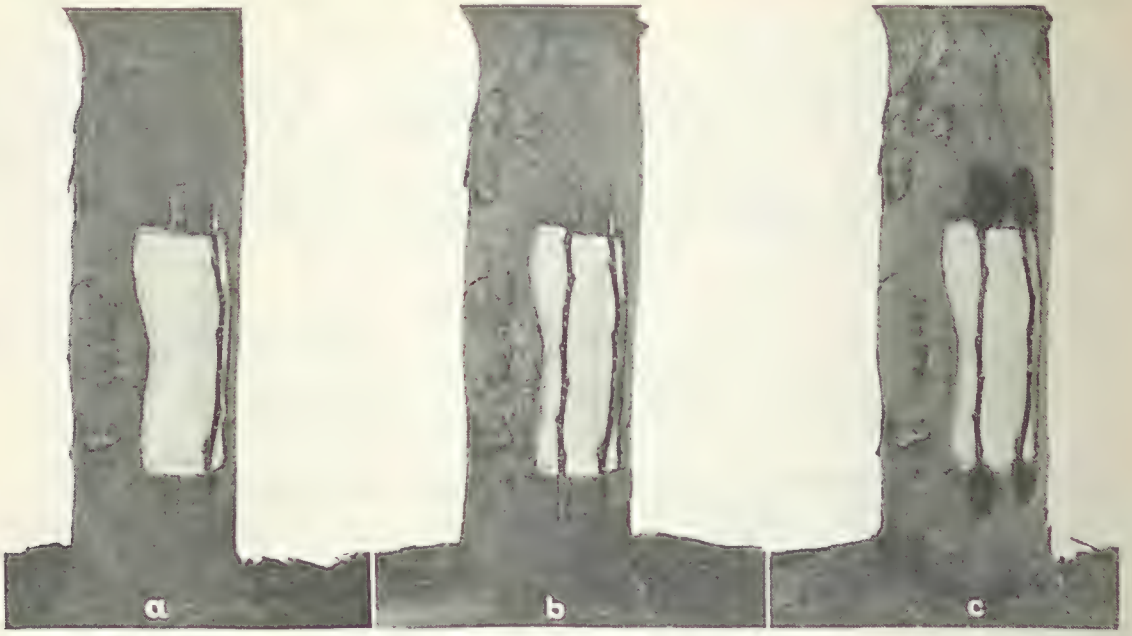

Fig. 58.—Bridge grafts showing, (a) method of preparing stock, and one scion inserted, (b) two scions tacked in position before sealing, (c) grafts after sealing.

side of the scion. Usually the outside facing slope of the wedge is made a little shorter than the slope which will lie against the wood of the stock (Fig. 59).

Insertion of the Scion.

The wedge-shaped base of the scion is inserted beneath the flap of bark on the lower edge of the wound so that the long sloping face lies against the wood. This end of the scion and the flap of bark are held in position by a $\frac{1}{2}$-inch or $\frac{5}{8}$-inch tack or brad. The scion is bowed towards the operator, and the apex is inserted beneath the flap of bark on the upper edge of the wound and tacked in position (Fig. 58 "*b*"). This process is repeated for the insertion of each of the other scions. A slight bow in the scion when the graft is completed is desirable.

Fig. 59.—One end of the bridge graft scion showing long and short cuts of wedge.

Sealing.

The graft is sealed, as shown in Fig. 58 "*c*."

Use of Suckers for Bridge Graft.

Occasionally, well-grown suckers, if in a suitable position, can be used to bridge a wound on the trunk or on the base of a main limb. The top of the sucker is cut to the required length, and the end shaped into a long wedge, which is inserted beneath the bark, tacked and sealed.

Inarching.

The forms of grafting which have been described previously have been concerned with that part of the fruit tree above the ground. Inarching is important, because it improves the root system of the tree. It is an operation in which a young tree is planted at the base of an established tree, and its stem is grafted on to the trunk of the older tree. The object of inarching is to re-invigorate a tree by giving it a stronger root system. This is accomplished either by the gradual replacement of the existing root system by a more vigorous one, or by providing a supplementary root system.

In Victoria, in one instance, the root system of Glou Morceau pear trees on quince root-tock has been replaced, either partially or entirely, by inarching with pear seedings, (5) (and Figs. 60-62). The growth of many Granny Smith apple trees on Northern Spy root stock

has been unsatisfactory, and inarching with selected apple seedlings should be practised to re-invigorate such trees. Citrus trees also may be inarched with either sour orange, sweet orange, or rough lemon (citronelle) seedlings as required.

Until standardized, vegetatively-raised root stocks are available, vigorous selected seedling trees should be used for inarching existing trees which it is desired to re-invigorate.

Method of Inarching.

During August or September, one or more compatible seedlings of the desired root stock are planted near the base of the tree.

The existing root system of the established tree, particularly if it is old, affects the position in which seedlings can be planted, and this in turn determines within fairly narrow limits the points on the trunk where inarching can take place. Hearman, *et al,* (6) have shown that if a single inarch is made in some positions on the trunk, only portion of the tree, in the first few years, may be invigorated. The grower, lacking a detailed knowledge of the tree's anatomy, may find it difficult to decide upon the best place for the inarch, and therefore it is suggested that three seedlings, spaced as evenly as the existing root system will permit, should be planted around the trunk.

Fig. 61.—Close-up picture of trunk of tree shown in Fig. 60. Note the quince root-stock completely rotted away. Inarched pear seedling on right.

Fig. 60.—A Glou Morceau pear tree originally worked on quince root-stock inarched with pear seedling 35 years ago.

The inarching operation is performed in the spring as soon as the bark can be lifted easily from the wood. For pears and citrus, this period extends from about mid-September until mid-October, and in the case of apples from mid-October to mid-November.

Either of two methods of inarching can be used. In one case, Fig. 63, a "⊥" (inverted "T") cut is made in the bark of the trunk about 12 to 18 inches from the soil level. It is advisable to gouge out a small piece of bark just below the junction of the horizontal and vertical cuts so that the stem of the seedling lies as close as possible to the bark of the trunk. For this method the seedling is prepared by making a single, sloping cut about 1½ inches to 2 inches long on the side facing the trunk. Sometimes the top of the seedling is cut wedge-shaped. This cut end is inserted under the raised flaps of the inverted "T" cut in the trunk. The seedling is held

Fig. 62.—Trunk of Glou Morceau pear tree showing pear seedling inarched on the left and the original quince root-stock surviving on the right.

in position by two ⅜-inch brads through the flaps of bark, or by binding with raffia, or twine, around the trunk.

In the second method (Fig. 64) two vertical parallel cuts 1½ inches to 2 inches long are made in the trunk at the same height as that stated in the first method. The width apart of these parallel cuts depends on the thickness of the seedling. Across the top and bottom of these two cuts, two further cuts are made, and the oblong piece of bark is lifted out. The top of the seedling is cut off at a point about three-quarters of an inch higher than the top of the prepared area of the trunk. On the side of the seedling facing the trunk a sloping cut is made commencing at a point opposite the bottom of the prepared area on the trunk. On the opposite side of the seedling a bevel cut is made about half an inch long, and this wedge-shaped end is pushed under the bark at the top of the prepared area. The long cut on the seedling lies in the area from which the bark was removed, and the seedling is held in place by a single brad. The bevelled cut on the top of the seedling can be inserted more easily below the bark at the top of the prepared area or "slot" if the vertical cuts are continued about half an inch higher than the top horizontal cut, thereby forming a flap of bark.

Sealing and Subsequent Treatment.

The grafts should be sealed. Resealing at a later date may be necessary. If raffia or string has been used for binding, it should be cut about a month after grafting.

If the seedling produces shoots, they should be curtailed by pinching or topping, but in the first year they should not be removed entirely. Later, these growths can be removed.

The seedlings are planted so close to the trunk that they may suffer from drought during their early life and, therefore, it is recommended for the first two seasons they should be watered when necessary and the soil around them lightly cultivated.

Sealing and Sealing Materials.

Until scion and stock unite, all grafts require protection from drying out. In some cases this is provided by burying the graft in the soil—e.g., in the propagation of apple trees by bench-grafting—or, as in the bench-grafting of vines or phylloxera resistant stocks, by packing the grafts in damp sphagnum moss and

Fig. 63.—The inverted "T" cut method of inarching, showing the sloping cut on the seedling (about natural size) and the completed operation before sealing.

placing them in special callusing sheds, where both the temperature and the humidity can be controlled until callusing is complete.

In the field, the more usual methods of sealing the graft, and thereby protecting the scion from drying out, are covering it with clay (this is suitable only for top-working methods), wrapping it in waxed cloth or waxed paper, or smearing it with grafting wax or with one of the petroleum or bituminous products which are now available.

Sealing materials, in addition to preventing drying out, prevent the entrance of water, diseases, and insect pests into the graft. It is not necessary to apply a thick covering or seal, but the material must be applied carefully, to avoid misplacement of the scion, and thoroughly, so that a complete seal is obtained. Sealing should be done as soon as the graft is completed. Grafts should be inspected every five or six days during the first month, and resealed if the sealing material has cracked or peeled.

The requirements of a good sealing material are that it should exclude air, disease, and insect pests, and cause no injury to the plant tissues. It should be pliable and sufficiently permanent to last, without cracking or melting, until union between the scion and stock has occurred, and it should be cheap and easily applied. No one material has been found to fulfil all these requirements, but several have been employed successfully in Victoria, and it is proposed to describe briefly these materials.

Clay and Cow Manure.

A mixture of clay (or soil) and old cow manure made into a thick paste has been used for many years for sealing grafts on old trees which have been top-worked. The material has been generally successful, but there is a real danger of fungous infection, so it is not recommended. The same objection applies to the use of soil placed in a paper container tied around the graft.

Grafting Waxes.

There are many substances which, when melted together in various proportions, form a more or less suitable sealing material for grafts. The most common recipe is 4 lb. resin, 2 lb. beeswax, and 1 lb. tallow. The three substances are melted together, mixed thoroughly, and while still hot poured into cold water.

Fig. 64.—The "slot" method of inarching. A.—The slot prepared in the trunk—note top flap of bark. B.—Preparation of the top of the seedling showing long cut, but note also short sloping cut on left side. C.—Completed inarch before sealing.

When cool enough, the mixture is worked with greased hands until it becomes grained and light coloured. The consistency of this wax can be varied to suit the operator's requirements. Increasing the amount of tallow makes the wax softer, and increasing the amount of resin yields a harder wax. The warmth of the hands may be sufficient to make this wax pliable enough for sealing the graft, or it may be necessary to warm it over hot water. When the wax is heated, care should be taken to ensure that the wax is not hot enough to injure plant tissue. Melted wax can be applied with a brush.

Another grafting wax of this type is made by melting together 6 lb. resin, 10 lb. beeswax, and 4 lb. raw linseed oil, and then *slowly* adding 5 lb. honey. It is particularly important to add the honey slowly in small quantities, because the mixture froths and is liable to overflow the container and, if over the fire, ignite. It is safer to remove the mixture from the fire before adding the honey.

Waxed Cloth and Paper.

Strips of unbleached calico, thin linen, or cotton material, or light-weight brown paper (kraft paper), about 1 foot wide, are dipped

quickly into one of the above waxes whilst the mixture is hot. The strips are then hung over a line to dry, taking care that the material does not stick together while still hot. When dry it is folded up.

If a large quantity of waxed cloth is required, the strips should be rolled on a short stock, placed in the hot mixture, and then drawn out through a saw-cut in a stick held over the container so that the surplus wax is removed. The cloth is dried and then folded up.

Before using this waxed cloth or paper it is cut up into lengths with a sharp knife. A convenient size for these lengths is half an inch wide and 9 inches long, but this depends on the size of the graft to be tied and sealed.

This waxed cloth is used chiefly for tying and sealing whip-tongue grafts.

Bituminous Products.

In Victoria, a fairly thick mixture of "Colas"—a type of bituminous emulsion—and starch has been used for some years. To make this mixture a tablespoonful of ordinary powdered starch is heated with one and a half pints of Colas until the starch is "cooked." To thicken the mixture add more starch; to thin, add more Colas.

When it is applied liberally to the graft it makes a satisfactory seal.

This mixture is fairly elastic, but some cracking occurs, and re-sealing is then necessary. A disadvantage of Colas is that after storing for a while separation occurs. To overcome this it should be purchased fresh in small quantities as required.

A proprietary product called "Colgraft" is available for sealing grafts. It is a thickened and stabilized form of Colas which has given satisfactory results. If too thick for use a little water may be added to thin this material.

"Tree Salve," another bituminous substance, similar to Colgraft, has been used successfully for some years for the sealing of grafts.

Petroleum Products.

Crude petroleum jelly has been used, but proved unsatisfactory in Victoria because high temperatures caused it to melt, and resulted in injury to plant tissues.

"Mastic II," a modified petroleum jelly product, is also available; but it has not been tested thoroughly in Victoria.

Petroleum jelly products should not be used for sealing cherry grafts. Injury to plant tissues has occurred in Victoria, due to the use of one of these substances.

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Pendulous Crop in Turkeys

Pendulous crop is a trouble affecting turkeys, and is very prevalent in America, while a number of cases are known in this country. The cause of the condition has not yet been found, although a considerable amount of research work has been carried out in regard to it in America. It is brought about mainly by two factors. In the first place probably heredity has a lot to do with the condition, and it has been found that breeding only with resistant stock has been most beneficial. It is also noticed that climatic conditions influence the prevalence of the trouble, particularly hot dry weather when there is scarcity of water. The turkeys become very thirsty, and if away from water for a time they then drink excessively, filling the crop with water, bringing about this distension of the crop which gradually becomes permanent. No medicinal treatment is of any avail.

The condition may be improved in the early stages by massaging the crop, emptying it of its contents, and rationing the water supply in order to prevent the crop from becoming overdistended. One thing should certainly be noted, and that is—birds in which this trouble develops should not be used to breed from. Where this condition has developed in America, losses are about 60 per cent., and the trouble certainly runs in families.

Live Stock Notes

Compiled by
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Reminders for November—December

Stock Foods from the Flax Plant.

STOCK foods from the flax plant include flax-boll chaff, flax seed refuse or screenings, flax seed (linseed), and linseed meal.

Although grown essentially for fibre, some 6,000 tons of flax-boll chaff, 7,500 tons of flax seed, and 1,000 tons of flax-seed screenings should be produced from the 28,000 acres of flax sown in Victoria this year. Most of the flax-boll chaff and flax-seed screenings will be offered directly to farmers as stock foods, and flax seed not required for re-seeding next year's crop will be offered to linseed oil manufacturers. From this seed, linseed oil and the by-product, linseed meal will be produced.

With the exception of linseed meal, these stock foods are all produced during the de-seeding process, when the flax is first received at the mill in January, February, and March. As the storage capacity for flax-boll chaff and flax-seed screenings at the flax mills is limited, it is desirable that most of these products be sold as soon as they are produced. Unfortunately, only limited stock feeding is then being done, and, in the past, few farmers have taken the opportunity of buying the relatively cheap flax-boll chaff without some forceful selling on the part of the flax-mill managers. Very frequently farmers do not buy fodder until it is required for feeding and, by that time, prices have often risen to high levels.

Flax-Boll Chaff.

Although flax-boll chaff contains a large amount of fibre, it makes a really good feed for dairy cattle and can replace meadow hay or silage in the rations. It has a fairly high protein content, being better than oaten hay and nearly as good as clover and lucerne hays, but in other nutrients it is as low as oaten straw. It makes a balanced food insofar as protein and energy-producing nutrients are concerned, but is unbalanced for bulk and total nutrients. As a good bulk food for cattle, sheep, and horses, flax-boll chaff is worth a price midway between the prices of oaten hay or chaff and oaten straw.

Varying quantities of seed are present in flax-boll chaff, but the seed is of little value as it passes undigested through both cattle and horses.

The chemical analyses and food values of flax-boll chaff, oaten hay, and oaten straw are as follow:—

	Flax-Boll Chaff per cent.	Oaten Hay per cent.	Oaten Straw per cent.
Moisture	12.0	12.6	11.0
Ash	5.0	5.8	6.1
Crude Protein	8.5	4.9	2.2
Crude Fat	2.5	2.5	1.6
Crude Fibre	30.0	23.5	31.0
Carbohydrate	42.0	50.7	48.1
Starch Equivalent	22.0	42.0	21.0
Protein Equivalent	6.5	3.5	0.6

Flax-boll chaff may be fed to replace oaten and meadow hays or chaffs in the rations of milking cows, dry cattle, and horses.

Flax Seed Screenings.

Flax-seed screenings contain large quantities of immature flax-seed and weed seed, in addition to boll chaff or husk, straw, and other refuse. On analysis, the material has a higher food value than the boll chaff, but it must be ground before animals can digest the seeds. When ground, the flax-seed refuse makes a good food for horses, cattle, and sows.

Feed Flax Products Dry.

A cyanogenetic glucose, which produces prussic acid, is sometimes present in flax seed, and, although no cases of poisoning have been attributed to the feeding of foodstuffs containing flax seed in Victoria, it is advisable to observe some precautions when feeding it. For instance, flax-boll chaff should be fed dry and flax-seed refuse or flax seed should either be fed dry or thoroughly boiled before feeding.

Damping or soaking of these materials liberates prussic acid from any cyanogenetic glucoside present in the seed. When fed dry, the gastric juices render the cyanogenetic glucosides harmless. Thorough boiling also destroys the glucosides.

Procuring Supplies.

Farmers, interested in the purchase of flax-boll chaff and flax-seed screening, should address their inquiries to the Chairman, Flax Production Committee, Department of Supply and Development, Melbourne, or the manager of the nearest flax mill.

Dairy Cattle.

The quantity of fodder that should be conserved for the dairy herd will vary considerably, but generally farmers should aim at conserving about 2 tons of hay or 5 tons of silage each year for each dairy cow. This amount would include feed for the young stock, bulls, &c. In a good irrigation district or where there is good paddock feed for eight or nine months of the year, half of these quantities may be sufficient. On the other hand, in a borderline dairying district more may be required.

In a good season it is unlikely that a dairy cow will eat her portion of the 2 tons of hay or 5 tons of silage as supplementary feed, as this equals about 10 lb. of hay or 25 lb. of silage per day throughout the year. A reserve, therefore, may be accumulated for bad seasons and droughts, when more hand-feeding will be necessary, and when there will be little or no surplus feed to conserve for the following year. In such bad seasons, less provident farmers have to buy feed to keep their stock alive, and this enables other farmers to sell their surplus reserves at remunerative prices.

A roller conveyor used for loading milk on a Tongala farm.

Sheep.

When shearing is completed, dipping to destroy sheep ticks and lice, is the the next routine job on the sheep farm.

Dipping is best done immediately after shearing, although the Sheep Dipping Act provides that it may be delayed by 60 days if the sheep are kept in securely fenced paddocks. Within 30 days of dipping, a return on the prescribed form must be posted to the Chief Veterinary Inspector, Melbourne, C.2.

For dipping to be effective, a reliable brand of dip should be used and the instructions on the package carefully followed.

Before mixing the dip, the bath should be thoroughly cleaned out and filled with a known or accurately measured quantity of clean fresh water. The correct quantity of dipping agent then may be added according to instructions. During operations the dip should be kept thoroughly stirred.

After a number of sheep have passed through the dip, its level will be reduced, and it will need refilling. When this is being done the quantity of added water must be accurately measured so that the exact quantity of dipping agent can be added to keep the dip at the proper strength.

Sheep badly infested with lice should be re-dipped fourteen days later to destroy the young lice which have hatched from eggs on the sheep at the first dipping. However, this dipping may not be necessary if the sheep are dipped immediately off shears, as the eggs are laid near the tip of the wool and will be removed with the fleece.

When sheep are badly infested with ticks, they should be redipped between 18 to 21 days later.

Pigs.

Pig values have risen in the last few months. There has been a good demand for baconers at improved prices, porkers have reached still higher prices per pound, backfatter sows have

been making good prices and now stores are selling very well again. This improved tone in the pig market is due to increased local and overseas trade for bacon and pork and, in the case of stores, to the good seasonal conditions in the dairying districts where an abundance of milk by-products is now available for pig feeding.

There has been a considerable decrease in pig breeding during the year and fewer pigs are expected to be marketed during 1942 than in 1941. However, pig breeders should not be misled into thinking that it is now easy to make a profit from pig raising. An increase in the price of pigs does not always agree with and cover the increased cost of production. Food is the biggest item in the cost of production and those pig raisers who purchase a large part of their foodstuffs as grain want a still higher price for their pigs to balance their costs.

The production of foods and pigs on the same farm to eliminate distribution costs is usually sound practice. Pig raisers are advised not to relax their endeavours to reduce production costs just because the price of pigs has improved.

L. A. Downey, H.D.A., Pig Expert.

Poultry.

Many beginners in poultry farming are inclined to think that it is necessary to cull pullets heavily during their first year of egg production, but this is not always a wise practice as pullets, bred from laying stock of good quality, well-reared, and kept in good health, usually do not require culling. It is only the obviously unfit birds that should be eliminated from the flock. When culling, it should be remembered that pullets of the same age do not always commence laying at the same time, and, therefore, there is considerable variation in different individuals in regard to the width of the pelvic bones and softness of the abdomen, from the period of non-production up to the time of maximum egg production. It must be realized, also, that the cost of replacement is high and every bird culled is a serious loss to the poultry farmer. Experience has taught breeders that to secure uniform superiority amongst the birds, they must carry on the selection of breeding stock for generations. If birds with desirable qualities are selected, it should not be expected that all their progeny will have those desirable qualities, but a better average will be obtained than when no selection had been made at all.

Considerable waste often occurs on the poultry farm, and if success is to be assured serious consideration should be given to this matter. One form of waste often noticed is the method of supplying food to the birds. Dry food hoppers should be so constructed that the food cannot come to the top of the outlet and be scratched out by the birds. In some hoppers waste can be reduced if the outlet is fitted with a lip turned inside.

H. F. Clinton, Poultry Expert.

Bees.

As a result of the cold squally weather in late September and early October, brood rearing has been retarded in most districts, and the average strength of the colonies is below normal.

In the coastal districts, the cold weather also has been responsible for the gathering of very little honey, but now with warmer weather and cape weed in full bloom, more honey will be available, and the colonies should be showing a marked increase in strength.

When handling brood, each comb should be carefully examined for signs of disease, and, if any are found or suspected, the matter should be reported immediately to the Superintendent of Live Stock, Department of Agriculture, Melbourne, C.2. A number of cases of foul brood affecting the spring larvae have already been detected.

The notes on increasing colonies, queen rearing, strengthening colonies, and swarming, published in this *Journal* for October, also apply this month.

J. W. Thomlinson, Apiary Inspector.

Veterinary Notes.

Entero-toxaemia (Pulpy Kidney) in Calves.

Entero-toxaemia is common among lambs, but its presence in calves has recently been demonstrated in some instances of calf mortality. Owing to the fact that suitable material from calves is rarely submitted for examination at the Veterinary Research Institute, entero-toxaemia may be more common among calves than is generally believed.

[*Continued on page* 575.

Pig Raising Competition

1941 Results

By
L. A. DOWNEY, H.D.A.,
Pig Expert

THE Second Annual Pig Raising Competition, conducted by the Royal Agricultural Society of Victoria, the Victorian Branch of the Australian Stud Pig Breeders' Society, and the Department of Agriculture, was completed on the 18th September, 1941, when the carcasses of the baconer and porker pigs were appraised and exhibited with the live pigs representing the competing litters at the Melbourne City Abattoir.

A description of the objects and conditions of these competitions was published with the report of the results of the first year's competition in this journal in October, 1940.

In the case of baconers, in this year's competition, an alteration was made in the scale of points under the heading of "Growth Points" in that the average live weight of the two pigs comprising the entry on the 17th September was divided by their age in days and multiplied by 70, and not by 100 as was done last year. In the case of porkers the multiplication was again by 100. This alteration was made in the light of the first year's experience in an endeavour to put somewhat similar emphasis on each of the three recorded factors: litter weight at eight weeks old, rate of growth to slaughter, and carcass quality.

The two pigs representing each recorded litter were exhibited and weighed between 8 a.m. and 10 a.m., on the 17th September, after having been deprived of food and drink since 6 p.m. on the previous day. Last year, feeding of the pigs was allowed right up to the time of weighing.

Each year a draw is made to decide which pig of each entry, the heavier or the lighter, is to be slaughtered for carcass appraisal. This year the heavier pigs were drawn and were slaughtered immediately after weighing. The carcasses were chilled sufficiently to make them firm for measuring, and they were weighed as they were taken from the chilling chamber, preparatory to appraisal on the 18th September.

Despite the unfavourable conditions of labour and transport, and the absence of a Royal Show, the competition was again well supported, there being 12 entries in the baconer class and 8 entries in the porker class.

The most interesting observation from the results is that it was again demonstrated, particularly by the winning baconer entry of Messrs. Fairchild and Clutterbuck, that it is possible to obtain, highly developed in the one litter, those three desirable characters: heavy litter weight, rapid growth to slaughter weight, and carcass quality. The desirable balance of those three factors is important to the pig industry.

There was a general improvement in the points gained in this year's, as compared with last year's, competition, and this was most noticeable in the porker class where the entries were uniformly good. (See tables 3 and 4.)

In the baconer section entries Nos. 1 and 2 lowered the average, because their carcasses were too fat, and that caused them to lose many points for backfat and body length. These two entries had very good growth points and, with advantage to their carcass condition, could have been grown more slowly in the later stage of their development. The weights of these two carcasses were 179 lb. and 180 lb.

Tables 1 and 2 summarize the results of the baconer and porker classes respectively.

RESULTS OF BACON AND PORK PIG COMPETITION, 1941.

Table I.—Bacon Class.

Owner's Name and Entry Number.	Breeding of Litter.	Litter at 8 Weeks.		Average Live Weight of Two Pigs Entered 17.9.41	Points Scored.				
		Sexes.	Weight.		Production Points.	Growth Points.	Carcass Points.	Total Points.	Place.
			lb.	lb.					
Fairchild and Clutterbuck (No. 6.)	Mittadale President 3rd Vaucluse Vanity 178th (Large White)	M-8 F-4	392	210 (168 days)	78	87½	72½	238	1st G.C.M.
C. T. Harrison .. (No. 8.)	Promview King 141st Eastside Maid 3rd (Large White)	M-4 F-5	399	168½ (161 days)	79½	73½	73½	226	2nd G.C.M.
Fairchild and Clutterbuck (No. 7.)	Mittadale President 3rd Vaucluse Vanity 178th (Large White)	M-8 F-4	392	193 (168 days)	78	80	67	225	3rd G.C.M.
I. E. and F. Hawtin (No. 9.)	Rossmoyne Centurian 37th Rossmoyne Maiden 45th (Large White)	M-6 F-5	453	178½ (165 days)	90½	75½	58½	224½	4th
Longerenong Agricultural College (No. 3.)	Promview King 105th Longerenong Superior 10th (Large White)	M-6 F-5	417	223½ (204 days)	83	76½	63	222½	5th G.C.M.
Longerenong Agricultural College (No. 4.)	Promview King 105th Longerenong Primrose 37th (Large White)	M-3 F-8	417	192 (190 days)	83	70½	61½	215	6th G.C.M.
J. Rintoul .. (No. 1.)	Highfield's Renown 11th Vaucluse Duchess 40th (Large White)	M-9 F-3	411	229½ (200 days)	82	80	45	207	Equal 7th
I. E. and F. Hawtin (No. 10.)	Rossmoyne Royal 11th Rossmoyne Sunray 11th (Berkshire)	M-5 F-5	426	163½ (164 days)	85	69½	52½	207	Equal 7th
Trenery and Soderlund (No. 12.)	Creek Banner 26th Promview Ada (Large White)	M-5 F-5	346	211½ (181 days)	69	81½	54½	205	9th
J. Rintoul .. (No. 2.)	Highfield's Renown 11th Vaucluse Duchess 40th (Large White)	M-9 F-3	411	227½ (200 days)	82	79½	42	203½	10th
Trenery and Soderlund (No. 11.)	Creek Banner 26th Promview Ada (Large White)	M-5 F-5	346	195 (181 days)	69	75	58	202	11th
Dr. A. R. Haywood (No. 5.)	Pinemount Rex 2nd Windrest Flighty 2nd (Wessex Saddleback Large White)	M-4 F-3	300	210 (176 days)	60	83½	53½	197	12th

Production Points.—One point for each 5 lb. of litter weight at eight weeks.
Growth Points.—Average live weight of the two pigs entered divided by days of age, and multiplied by 70.
Carcass Points.—Percentage on appraisal.
G.C.M.—Awarded a Government Certificate of Merit for having secured not less than 200 total points with not less than 60 points for production, growth or carcass.

The above illustrations show the whole carcass and its loin cut, together with the remaining pig of each entry and condition between the pig photographed alive and its mate whose carcass is shown, each illustration gives these illustrations correspond with the entry numbers shown in Table I. (page 549) which gives the performance

ch entry comprised two pigs from the same litter, and as there was a close resemblance in weight, conformation d indication of the correlation between the appearance of the live pig and the carcass. The numbers shown on each pig. The first, second and third places were filled by entries Nos. 6, 8 and 7 respectively.

Table II.—Porker Class.

Owner's Name and Entry Number.	Breeding of Litter.	Litter at 8 Weeks.		Average Live Weight of Two Pigs Entered 17.9.41.	Points Scored.				
		Sexes.	Weight.		Production Points.	Growth Points.	Carcass Points.	Total Points.	Place.
			lb.	lb.					
Longerenong Agricultural College (No. 15.)	S. Promview King 135th D. Longerenong Lucy 39th (L.W. x M.W. Cross)	M-6 F-4	401	129½ (131 days)	80	98½	63	241½	1st G.C.M.
Longerenong Agricultural College (No. 16.)	S. Promview King 105th D. Longerenong Pearl 24th (L.W. x M.W. Cross)	M-6 F-4	344	133½ (131 days)	68½	101½	60	230	2nd G.C.M.
L. H. Castle ... (No. 14.)	S. Waroin Bladennis 9th D. Kinilabah Edna (Large White x Tamworth)	M 9 F-3	379	103 (122 days)	75½	84	68½	228	3rd G.C.M.
L. H. Castle .. (No. 13.)	S. Waroin Bladennis 9th D. Kinilabah Edna (Large White x Tamworth)	M-9 F-3	379	100½ (122 days)	75½	82	65	222½	4th G.C.M.
C. T. Harrison .. (No. 18.)	S. Promview King 141st D. Eastside Beautiful 1st (Large White)	M-4 F-5	355	89½ (111 days)	71	80½	66½	218	5th G.C.M.
C. T. Harrison .. (No. 17.)	S. Eastside Banner Boy D. Eastside Beautiful 5th (Large White)	M-2 F-7	326	109 (129 days)	65	84	67½	216½	6th G.C.M.
Trenery and Soderlund (No. 19.)	S. Highfield's David 54th D. Promview Gertie 10th (Large White)	M-3 F-4	253	122½ (126 days)	50½	97	68	215½	7th
Trenery and Soderlund (No. 20.)	S. Highfield's David 54th D. Promview Gertie 10th (Large White)	M-3 F-4	253	114½ (126 days)	50½	90½	71½	212½	8th

Production Points.—One point for each 5 lb. of litter weight at eight weeks.
Growth Points.—Average live weight of the two pigs entered divided by days of age and multiplied by 100.
Carcass Points.—Percentage on appraisal.
G.C.M.—Awarded a Government Certificate of Merit for having secured not less than 200 total points with not less than 60 points for production, growth or carcass.

The rapid average growth rate of the entries is shown below:—

Average live weight of the pigs in the baconer entries ..	200 lb.
Average carcass weight of the heavier pigs of the baconer entries	158 lb.
Average estimated carcass weight of the lighter pigs of the baconer entries	150 lb.
Average age of the pigs in the baconer entries	180 days
Average live weight of the two pigs in the porker entries ..	113 lb.
Average carcass weight of the heavier pigs of the porker entries	89 lb.
Average estimated carcass weight of the lighter pigs in the porker entries	84 lb.
Average age of the pigs in the porker entries	125 days

The carcass, its loin cut, and the remaining live pig of the winning porker entry, No. 15.

TABLE III.—BACONER CLASS.

Points Awarded For—	Production Points (Total Litter Weight).		Growth Points (Weight for Age).		Carcass Points (Percentage on Appraisal).		Total Points.	
	1940.	1941.	1940.	1940.	1940.	1941.	1940.	1941.
Highest	89	90·5	63	69·5	72·5	73·5	240	238
Lowest	58	60	86	87·5	50·5	42	184	197
Average	74·3	78·2	73·8	77·6	62·5	58·4	210·7	214·3

TABLE IV.—PORKER CLASS.

Points Awarded For—	Production Points (Total Litter Weight).		Growth Points (Weight for Age).		Carcass Points (Percentage on Appraisal).		Total Points.	
	1940.	1941.	1940.	1940.	1940.	1941.	1940.	1941.
Highest	87·5	80	97·5	101·5	72·5	71·5	243	241
Lowest	32	50·5	58	80·5	56·5	60	151	212·5
Average	55·5	67	78·6	89·7	64·4	66·2	205·7	223

Tables 3 and 4 give a comparison of two years' results, the growth points for 1940 results for baconers having been adjusted to multiplication by 70 instead of by 100 to make them comparable with the 1941 results.

Accredited Brucellosis-free Herds (Swine).

The following herds of pigs have been accredited as free of swine brucellosis (contagious abortion of pigs) by the Department of Agriculture.

An accredited brucellosis-free herd of pigs is one in which all animals therein have been subjected to two successive blood tests for brucellosis with negative results at intervals prescribed by the Chief Veterinary Inspector of the Department.

In order to remain accredited, a semi-annual or annual re-test (as determined by the Chief Veterinary Inspector) of all animals in the herd shall be conducted. If at a re-test any animal fails to give a negative reaction to the test, the herd shall not be declared brucellosis-free again until two tests of the complete herd have been carried out with negative results.

Full particulars of the Accredited Swine Brucellosis-free Herd Scheme and application forms may be obtained from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Name.	Address.	Name.	Address.
Bowran, L. G.	"Glendare," Tallangatta	Horn, L. A.	Leongatha North
Bright, George H. ..	Dumbalk	Longerenong College ..	Dooen
Castle, L. H.	Clarinda	Pietsch R. E.	Katyil
Critten, H. S.	Dumbalk	Rintoul, J. T. C. ..	Glengarry
Dookie Agricultural College	Dookie	Roy, W. A.	Morrell's Hill, via Boolarra
Doornbusch, John L. ..	"Starpark", Nhill	State Experiment Farm	Rutherglen
Fairchild and Clutterbuck	Tinamba	Sutherland, R. N. ..	Nullawill
Geddes, L. D. ..	Bungaree	Trenery and Soderlund	"Promview", Foster
Harrison, C. T. ..	"Eastside" Stud, Pomborneit	Trigg, A. J.	Bungaree
		Trigg, N. H.	Bullarook
Hawtin, I. E. & F. ..	"Rossmoyne", Colac.	Tweddle, J. T. ..	"Winlaton," Shepparton
Haywood, Dr. A. R. ..	Hastings	Walch, M. U.	Baring

FEEDING CEREALS TO PIGS

Importance of Protein Supplements

Demonstration No. 2.—Rutherglen Experiment Farm

By N. C. Killeen, B.Agr.Sc., Science Field Officer, and S. H. Edwards, Field Assistant

Foreword by L. A. Downey, H.D.A., Pig Expert

When it is considered that, under efficient management, the equivalent of approximately 7½ cwt. of meal is required to produce a bacon pig with a dressed weight of 140 lb., and that the cost of this quantity of food represents approximately 80 per cent. of the total cost of producing and selling that pig, it is obvious that every effort should be made to reduce food consumption to an economic minimum.

Any deficiency in quantity or quality in the diet of pigs will result in higher food consumption per lb. of pork produced, slower growth with waste of labour and equipment, and predisposition to disease. It is important, therefore, that pig raisers should be familiar with the minimum food requirements for economic growth.

When cereal grains form the basis of the diet of pigs, farmers should know that these foods have not sufficient protein, minerals, or vitamins for pigs, and that unless these accessories are added to the grain diet a waste of food, time, and equipment, and, consequently, of money, will result.

Separated milk is the best known supplement for feeding with the cereal grains, but in its absence meat meal is a satisfactory substitute. To show the value of separated milk and meat meal as supplements to wheat and barley, demonstrations have been conducted at the Rutherglen Experiment Farm, and the results published herein give comparative cash returns for the different feeding treatments.

When large quantities of separated milk (2 or more gallons per pig daily) are fed, the mineral, lime, in the milk rectifies the lime deficiency of cereal grains, but when just sufficient separated milk (½ to ¾ gallons per pig daily) is used to supply the necessary protein, lime should be added in another form. A deficiency of lime in the diet causes pigs to grow slowly, to use more food per lb. of pork produced, and may result in deficiency diseases.

In the demonstrations to show the value of small quantities of milk and meat meal added to the grain diet, it was taken as known that a lime supplement was required, and a mixture of four parts ground limestone and one part salt was made available to all the pigs. Demonstrations to ascertain the value of this supplement are now in progress at the Rutherglen Experiment Farm.

Many vitamins are required by pigs, and they may be supplied in a good diet, but there are two vitamins, A and D, which are likely to be missed and whose absence causes most trouble in the health, growth, and reproduction of pigs. Wheat, barley, and oats are deficient in vitamins A and D, but green pasture supplies an abundance of A, while green lucerne or clover hay supply fair quantities. Lucerne or clover hay also supply vitamin D, but the most prolific source of this vitamin is direct sunlight shining on the pigs. Pasture should be provided for pigs where practicable, and in its absence a supply of clover or lucerne hay should be made available.

THAT the production of pigs by feeding grain alone is most uneconomical was clearly shown in the results of demonstration No. 1, at the Rutherglen Experiment Farm, dealt with in part one of this article.

The addition of ½ gallon of skim milk or ¼ lb. of high-grade meat meal per pig daily to the diet of pigs self-fed on barley and wheat, and running on very limited pasturage, gave large increases in the returns of pork per bushel of grain fed. It was evident, however, that ½ gallon of skim milk was more effective in balancing the diet than was ¼ lb. meat meal.

A further test was then conducted with various protein supplements, which might be used as alternatives according to the quantities available, and including combinations of skim milk and meat meal, and also meat meal, with linseed meal and clover hay. As cereal growers often wonder whether they should crush wheat to be fed to pigs, a test on this question was included also.

It is known that grain-fed pigs will make much more satisfactory growth when adequate protein supplement is added to the diet. The supplementary feeding of skim milk or protein-rich concentrate, such as meat meal, will provide a simple ration capable of producing pork inexpensively, at a much improved rate.

Where an adequate supply of skim milk is available, its use as a supplement to grain is satisfactory, without the addition of further protein. The milk supply, however, is very variable, particularly on a wheat farm, and if a considerable number of pigs is to be fattened throughout the year, there inevitably will be times when the skim milk supply is insufficient to give balance to the grain fed. When such conditions occur it is uneconomical to feed the reduced quantity of milk without additional supplement. The optimum percentage of protein to feed will vary according to the age and size of the pig, being higher for the younger animals. It is desirable that the younger animals should not be restricted in their skim milk ration, and should be given preference under conditions of milk shortage.

Older pigs also require protein in addition to the grain, but this can be added conveniently in the form of meat meal, or other concentrate, in such quantities as will make up the protein supplement to the equivalent of at least ½ gallon skim milk per head daily. A gallon of skim milk contains protein equivalent to 8-10 oz. of meat meal (60 per cent. protein). As previously stated, the protein requirements will vary according to the size of the pig, but owing to variations among pigs running together it is not practicable to feed precisely for the fluctuations of optimum requirements of each pig. The uniform feeding of ½ to ¾ gallon of skim milk (or its protein equivalent) daily is easily arranged, and will result in more economical production than haphazard feeding.

In the demonstration described below, pigs of similar age, weight, and breeding were raised from slips to light porker weights on the following rations, there being some dozen pigs in each group.

(1) Crushed wheat plus ¾ gallon skim milk daily.
(2) Crushed wheat plus ½ lb. daily of a supplement, consisting of meat meal 50 per cent., linseed meal 20 per cent., clover hay (chaffed) 20 per cent., ground limestone 8 per cent., and salt 2 per cent.
(3) Crushed wheat—no supplement.
(4) Whole wheat plus ¾ gallon skim milk daily.
(5) Whole wheat plus 2 per cent. meat meal and ¼ gallon skim milk daily.
(6) Crushed wheat plus 2 per cent. meat meal and ¼ gallon skim milk daily.

All pigs had access to a lick consisting of four parts ground limestone to one part salt, except Group 2, which received these minerals in the supplementary feed.

The grain was self fed. The milk and the mixed supplement were hand fed daily, while the meat meal was mixed with the grain.

Whole Versus Crushed Grain.

The cost of crushing grain is variously quoted as from 2d. to 3d. per bushel, according to quantities and facilities for crushing. The reluctance of some farmers to purchase a crushing plant, and the time taken up in crushing the grain, are factors which may have considerable influence on the method of feeding and the number of pigs carried.

To demonstrate whether the crushing of grain is justifiable economically, a comparison of whole and crushed wheat, with similar supplements, was included in the tests.

The pigs were so distributed that each group was comparable with regard to weight and breeding. When slips of about 49 lb. live weight they were placed under similar conditions of pasture, housing, &c., in grazing pens, and fed as indicated until they reached a live weight of approximately 120 lb. Each pig was weighed weekly, and its weight and the amount of feed consumed were recorded.

The pastures were in good condition and fairly even at the commencement of the test, but deteriorated somewhat during the dry spell in April. The yards containing Groups 1 and 4, which received ¾ gallon skim milk per head daily, were not so heavily punished by the pigs, and gave good pasturage throughout the test. A contributing factor in this effect was the removal from the test of the pigs as they reached 120 lb. weight, which occurred earlier in these lots.

The table sets out the relative rates of growth and fodder consumed in each of the treatments.

The net return per pig represents the estimated increase in value after deducting the price of the feed. Labour and overhead costs have not been included, as they are so variable.

The valuations adopted were:—

Skim milk, 1d. per gallon.
Meat meal, 1½d. per lb.
Clover hay, 1s. 3d. per 100 lb.
Linseed meal, 1½d. per lb.
Whole wheat, 3s. 4d. per bushel.
Crushed wheat, 3s. 6d. per bushel.

In this experiment whole wheat is valued at 3s. 4d. per bushel, but it is unlikely that the wheat farmer would receive this price on the farm.

The slips at the commencement of the test were valued at 15s. per head, and the increase in value of the pigs was estimated by subtracting this figure from the value of the pork at the completion of the test. Pork was estimated at 70 per cent. of the live weight, and priced at 6d. per lb. on the farm. Although the results are given in detail, monetary differences of less than 6d. per pig are not regarded as significant.

The graph shows the relative weekly gains in weight for each treatment, while further details of the experiment will be found in the table hereunder.

Self-feeder in use at Rutherglen Experiment Farm.

The group fed on grain only did not gain weight as economically nor as rapidly as those given the other supplements, and failed to reach good marketable condition during the test. It recorded, however, a much better performance than in the previous demonstration, presumably due to the better pasturage, together with the fact that the pigs were somewhat heavier at the commencement of the test. It must be remembered that young pigs need a higher proportion of protein in their diet than do older ones, and that the amount of supplementary feeding of protein required is decreased when protein-rich pasture is supplied.

	Group 1.	*Group 2.*	*Group 3.*	*Group 4.*	*Group 5.*	*Group 6.*
	Crushed Wheat and ¾ gallon Skim Milk per Head Daily.	Crushed Wheat and ¼ lb. Supplement Mixture per Head Daily.	Crushed Wheat. No Supplement.	Whole Wheat and ¾ gallon Skim Milk per Head Daily.	Whole Wheat and 2 per cent. Meat Meal and ¼ gallon Skim Milk per Head Daily.	Crushed Wheat and 2 per cent. Meat Meal and ¼ gallon Skim Milk per Head Daily.
No. of pigs	12	13	11	12	13	13
Average No. of days in test	46	70	81	46	58	55
Average weight at commencement	50·2 lb.	49·4 lb.	49·4 lb.	50·8 lb.	49·8 lb.	49·5 lb.
Average finishing weight	122·9 ,,	123·8 ,,	114·4 ,,	121·0 ,,	122·9 ,,	123·6 ,,
Average gain per pig	72·8 ,,	74·4 ,,	65·0 ,,	70·2 ,,	73·1 ,,	74·1 ,,
Average daily gain	1·58 ,,	1·06 ,,	·0·80 ,,	1·52 ,,	1·26 ,,	1·35 ,,
Average grain consumed daily	3·18 ,,	2·37 ,,	2·91 ,,	3·17 ,,	3·22 ,,	3·29 ,,
Grain fed per 100 lb. live-weight gain	202 ,,	267 ,,	362 ,,	203 ,,	257 ,,	244 ,,
Supplement fed per 100 lb. live-weight gain	48·7 gals.	50·5 ,,	..	48·0 gals.	19·9 gals. 5·1 lb.	18·5 gals. 4·9 lb.
Gain in weight per bushel grain fed	29·8 lb.	22·4 ,,	16·6 ,,	28·8 lb.	23·3 lb.	24·6 ,,
Total grain consumed	1,760 ,,	2,585 ,,	2,590 ,,	1,755 ,,	2,445 ,,	2,350 ,,
Total supplement consumed	415 ,,	448 ,,	..	415 ,,	189 gals. 48·9 lb.	178·5 gals. 47·0 lb.
Total weight of pigs at commencement	602 ,,	642 ,,	543 ,,	610 ,,	648 ,,	643 ,,
Total finishing weight	1,475 ,,	1,609 ,,	1,258 ,,	1,452 ,,	1,598 ,,	1,607 ,,
Total gain in weight	873 ,,	967 ,,	715 ,,	842 ,,	950 ,,	964 ,,
Net return per pig	16s. 7d.	13s. 8d.	11s. 4d.	16s. 4d.	15s. 11d.	16s. 2d.

The tests again demonstrate the value of a protein supplement for grain-fed pigs, and stress the value of skim milk even when supplied in quantities as low as ¼ gallon daily. When skim milk is not available, or has been used for younger pigs, the shortage may be made up economically by the addition of a protein-rich concentrate.

The effects of crushing the wheat are shown by comparing the results of Group 1 with Group 4, and Group 6 with Group 5. In both

cases no significant increase due to crushing was obtained, the monetary advantage being shown as 3d. per pig, whereas in such a trial a difference of less than 6d. per pig cannot be regarded as significant. The costs of crushing the wheat consumed by each pig are approximately 6d., indicating that crushing was unpayable with self-fed pigs accustomed to take their food leisurely from the self-feeder. When pigs are hand fed, say twice a day, the grain is more likely to be bolted, and with less thorough mastication a higher percentage of undigested grain could be expected. Under these conditions crushing would be desirable.

Conclusions.

1. It was not economical to fatten pigs on a diet of grain alone even when fair pasturage was available.

2. Self-fed grain plus ¾ gallon of skim milk per day was a suitable ration for pigs from the weaner to the porker stage.

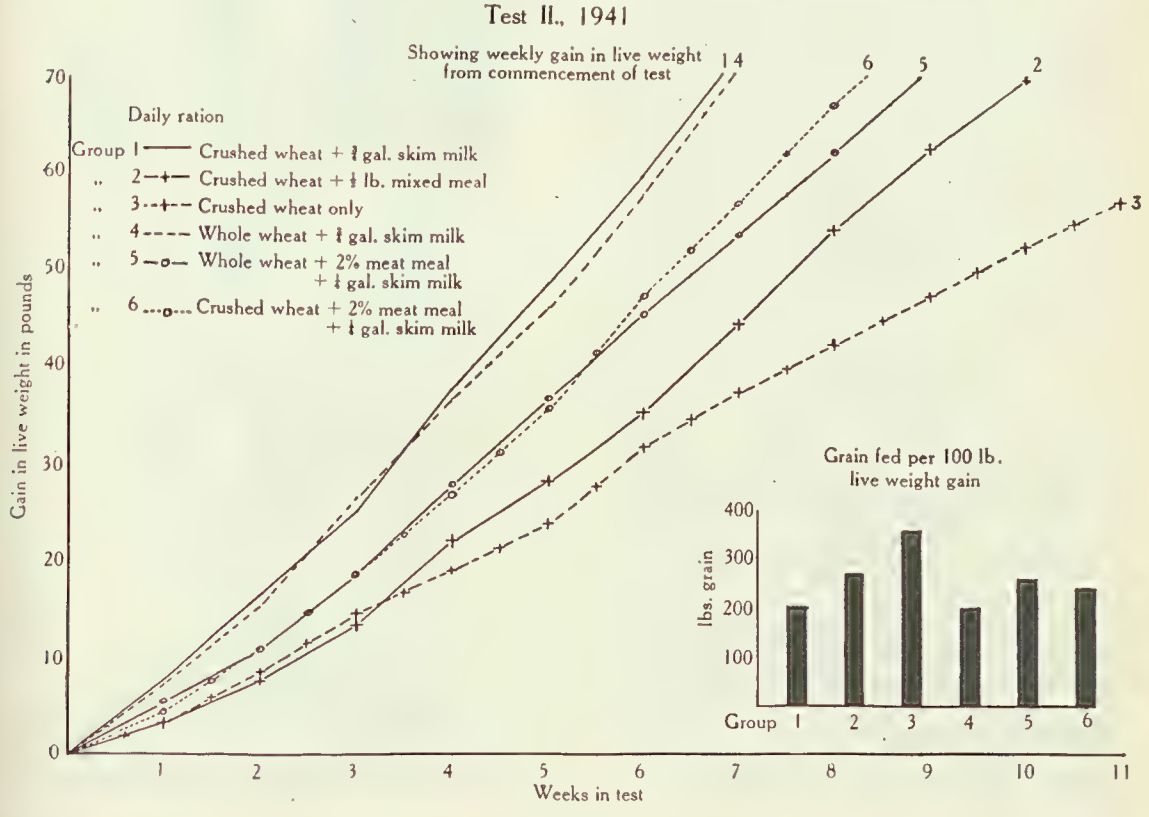
3. When the supplies of skim milk are limited, a satisfactory ration is ¼ gallon of skim milk daily in addition to self-fed wheat supplemented by 2 per cent. of meat meal. This ration, however, was less effective than that when ¾ gallon of skim milk daily was the supplement.

4. In the absence of skim milk, a daily allowance of ½ lb. per pig of the supplement containing meat meal, linseed meal, and chaffed clover hay was economical, as compared with the "no supplement" lot.

5. As the cost of crushing and double-handling is at least 2d. per bushel, it is not economical to do so when the grain is to be supplied in self feeders. This may not be the case where hand feeding is practised.

. . . . . .

The previous demonstration indicated that when skim milk is not available and the pasturage is poor, it is economical to supplement the grain fed by ¼ lb. meat meal per day, which is equivalent to feeding a mixture containing from 10 per cent. meat meal when the pigs are small to about 5 per cent. when they are 130 lb. live weight.


Test II., 1941
Showing weekly gain in live weight from commencement of test
Daily ration
Group 1 —— Crushed wheat + ¾ gal. skim milk
" 2 —+— Crushed wheat + ¼ lb. mixed meal
" 3 --+-- Crushed wheat only
" 4 ---- Whole wheat + ¾ gal. skim milk
" 5 —o— Whole wheat + 2% meat meal + ¾ gal. skim milk
" 6 ---o--- Crushed wheat + 2% meat meal + ¾ gal. skim milk
Gain in live weight in pounds
Weeks in test
Grain fed per 100 lb. live weight gain
lbs. grain
Group 1 2 3 4 5 6

Pasture Plants of Victoria

4. Barley Grasses (Genus Hordeum)

By W. D. ANDREW, M.Agr.Sc., Assistant Agrostologist

This is the fourth of a series of articles presented in simple form to enable members of Young Farmers' Clubs and others to obtain an elementary knowledge of the pasture plants of Victoria. Previous articles appeared in this Journal as follow:—1. The Rye grasses (February). 2. The Canary grasses (June). 3. Weeping grass, Scented Vernal grass, and Veldt grasses (October). An explanation of the botanical terms used will be found at the conclusion of this article. For descriptive illustrations of botanical terms readers should refer to previous articles.

THE two annual species of barley grass which occur in Victoria are widespread. Both produce nutritious succulent herbage during the late autumn and winter, but run to head early in the spring.

Throughout the northern sheep country the barley grasses are important pasture plants in the absence of better species, but in most other places are not regarded very favourably.

Apart from having a short season of growth these grasses bear sharp pointed "seeds" which are injurious to stock. As barley grass is a host plant for root rot organisms which infect wheat and barley, it is unwelcome on fallows in districts where these crops are grown. To kill barley grass several thorough cultivations should be undertaken before the cereal crop is sown.

In the better rainfall areas (*Hordeum murinum*) is the more common species and is confined mostly to small areas where soil fertility is very good.

Sea barley (*Hordeum maritimum*) is commonly found as the dominant grass on salty land, and is very common in the northern districts of Victoria.

A perennial species known as knotted barley grass (*Hordeum nodosum*) occurs in this State, but is relatively uncommon.

Barley Grass (Hordeum murinum, L.).

This annual grass is a native of Europe, Asia and Africa and was introduced into Victoria some time before 1878, probably as an impurity in agricultural seed and fodder.

Agricultural Features.

Under conditions where the rainfall is inadequate for the persistence of the better perennial grasses one finds barley grass prominent in the pastures which follow cultivation. It can hold its own against the competition of annual clovers

Barley Grass (Hordeum murinum. L.)
[After *Weeds of Sth. Africa.*

Left, head of Hordeum murinum; Right, head of Hordeum nodosum.

[After *Armstrong*

although it is somewhat suppressed by subterranean clover. In a dry year, however, barley grass takes the upper hand and becomes the main pasture species.

On land which has been sown down or allowed to go out to natural pasture it is not unusual to find barley grass dominating depressions which are subject to water-logging in the winter.

Barley grass flourishes under conditions of good soil fertility and is commonly found as the main grass in stock camps around trees and in the corners of paddocks. It makes relatively good growth during the colder part of the year when many of the perennial grasses are in an unproductive condition and flowers very early in the spring. When immature, this grass is a good fodder, but once the seed heads appear its nutritive value falls away rapidly and it becomes almost valueless. If hay containing seed heads is fed to horses it is likely to cause ulceration of the mucous membranes of the mouth.

Identification.

Barley grass usually grows to a height of from 6 to 9 inches and has a high proportion of leaf to stem. The plants are tufted annuals with elbowed stems and have leaves about 3 to 4 inches long and $\frac{1}{4}$ inch wide. These latter are light green with a dull surface and are sparsely hairy on both upper and lower faces. The leaf is closely veined and a distinct mid-rib can be seen on the underside. Young leaves are rolled and the ligule is about 1/16th inch in length and has a blunt point. The leaf sheath is usually non-hairy on the upper part, but may bear scattered hairs on the basal portion. It is split along one side, is slightly keeled and has prominent longitudinal ribbing.

At the junction of the leaf and leaf sheath there are conspicuous white-pointed auricles which encircle the stem and cross over at their tips. These serve as a ready means of distinguishing barley grass in the vegetative condition from a number of other annual grass species with which it is often associated.

Barley grass produces numerous flattened heads about 2 to 3 inches long. These emerge from the distended leaf sheaths from September onwards and ripen very quickly. Spikelets are borne in groups of three on alternate sides, at points along the main axis, and have their broad sides to the rachis. The centre spikelet is sessile, but lateral spikelets are borne on short pedicels.

When mature these groups of three break away attached to a short portion of the rachis. This acts as a spear-head when they work into the eyes, ears, nose, and skin of animals.

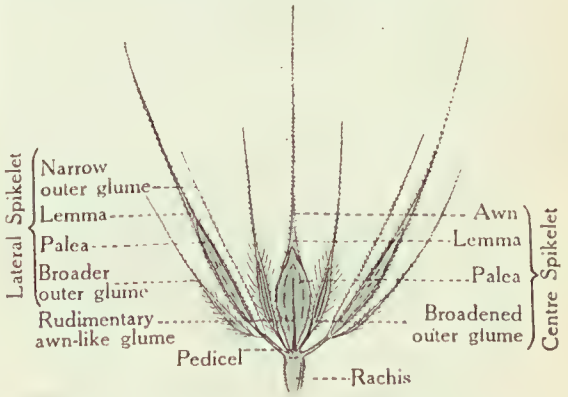


Diagram showing a triplet of spikelets of Hordeum murinum. Note, lateral spikelets are borne on pedicels. The centre spikelet is sessile, has a relatively short and wide floret, and its outer glumes are broadened toward their bases. The positions of the various glumes have been slightly displaced for clarity.

Sea Barley (Hordeum maritimum, With.). It is much smaller than the other two species described and does not have flattened heads. [After *Breakwell.*

Penetration is assisted by the presence of numerous short, fine, bristles on various parts of the spikelets which allow forward movement, but resist any reverse movement in a manner similar to the action of the barb on a fish hook.

The centre spikelet is usually complete, but the lateral ones consist of glumes which sometimes contain stamens, but have no ovary. All spikelets are one-flowered and have narrow "awn-like" outer glumes about 1 inch long, those of the centre spikelet being somewhat broader toward their bases. The outer flowering glume (lemma) of each lateral floret is about 1/16th inch in width and has inrolled edges. It is a little shorter than the outer glumes of the spikelet and tapers off to a long awn which adds about another inch to its length. The lemma of the centre spikelet is broader and shorter than the lemmas in the lateral spikelets, has a conspicuous mid-rib and bears an awn about 1¼ inch long. Each spikelet contains a palea which is a little narrower and shorter than the adjacent lemma and the centre spikelet has in addition a short "awn-like" glume at the back of the palea which sometimes bears an infertile flower. This glume is a prolongation of the rachilla.

Sea Barley (Hordeum maritimum, With.).

A native of Europe, this annual species was recorded as naturalized in Victoria in 1909. It is widespread in the Riverina and northern districts of this State, is common along the coast, and in the irrigation areas, particularly on salty land.

In general habit of growth it is similar to barley grass, but is more lowly and produces smaller seeding heads which are not flattened. Sea barley provides useful sheep feed during its short season of growth and is a useful pioneer species in the reclamation of salty country. In common with the other two barley grasses this species can tolerate wet poorly drained conditions during the winter. The leaves are hairy on both surfaces and are somewhat glaucous.

Seeding heads are similar in general make up to those of barley grass but if the spikelets are examined closely it will be noticed that the pair of outer glumes in the centre spikelet do not show any broadening toward their bases.

The outer glumes in the lateral spikelets are also narrow but one of each pair is a little wider than the other as in *Hordeum murinum.* None of the outer glumes has a fringe of hairs (cilia) at the base.

Knotted Barley Grass (Hordeum nodosum, L.). A relatively tall-growing, stemmy grass.

Knotted Barley Grass (Hordeum nodosum, L.).

Knotted barley grass is an introduced tufted short-lived perennial species, not common in Victoria. It prefers stiff clays and moist soils, and is sometimes found as a weed of cultivation.

This grass is a taller-growing species than ordinary barley grass and under favourable conditions may grow to a height of 2 feet. The foliage is sparse and rather stemmy, and sometimes the stems are elbowed. Leaves are hairy above but almost glabrous and glossy below. They are from 1 to 5 inches long and up to $\frac{1}{4}$ inch in width. Young leaves are rolled, the ligule is short, and the auricles are usually small and often very much reduced.

As the spikelets have shorter awns and these are not so strongly barbed as *Hordeum murinum* they are less harmful to stock and the heads soon break up when mature.

The spikes are more slender than those of barley grass and are usually shorter. Spikelets are mostly borne in groups of three with the floret of the lateral spikelet reduced and sterile. All outer glumes are similar and awn-like. The lemmas of the lateral spikelets have a short awn, but the one on the centre spikelet is up to $\frac{1}{2}$ inch in length and is longer than the flowering glumes.

GLOSSARY OF BOTANICAL TERMS.

Anther.—That portion of a stamen which contains the pollen.

Auricles.—Lobes, most common at the junction of leaf and leaf sheath.

Awn.—A slender bristle, often the prolongation of a mid-rib.

Blade.—The expanded portion of the leaf.

Caryopsis.—The grain of a grass in which the seed coat is fused to the wall of the ovary.

Cilia.—Hairs like eyelashes.

Entire.—Without toothing or division.

Flowering glumes or pales.—The glumes which enclose the ovary and stamens. They are known as the lemma and palea respectively.

Floret.—The flower of a grass plant. When complete it consists of two flowering glumes or pales enclosing an ovary and stamens.

Glabrous.—Without hairs.

Glaucous.—Covered with a bluish-green bloom, e.g., as a cabbage leaf.

Glumes.—Paper-like structures which make up the grass spikelet.

Leaf Sheath.—Portion of the leaf which wraps around the stem.

Lemma.—The flowering glume, which with the palea, encloses the ovary and stamens.

Ligule.—The thin structure on the inside of a leaf at the junction of sheath and blade. It is sometimes reduced to a semi-circle of hairs.

Outer Glumes.—The glumes which shield the florets.

Ovary.—The female part of the floret. It contains the immature seed or ovule.

Pale.—This term is used for either of the flowering glumes (palea or lemma).

Palea.—The flowering glume which is partly encased by the lemma.

Panicle.—A loose cluster of flowers.

Pedicel.—A flower stalk.

Peduncle.—The general term for the stalk of an inflorescence.

Protogynous.—A term used to indicate that the stigma matures before the pollen of the same flower.

Rachilla.—A secondary axis in the inflorescence of grasses.

Rachis.—The main axis of a spike or raceme.

Rhizome.—An underground creeping stem : "rootstock."

Seed.—After fertilization the ovule in the ovary develops into a seed (caryopsis). In most grasses this remains permanently encased by the flowering glumes or pales.

Spike.—An unbranched inflorescence in which the spikelets are sessile on the rachis.

Spikelet.—A group or a single floret shielded by one or more bracts or "outer glumes."

Stamen.—The part of the flower that bears the pollen. It consists of a pollen sack (anther) on a stalk (filament).

Sterile glume.—A glume which does not contain an ovary.

Sterile spikelet.—A spikelet which does not contain a fertile floret.

Stigma.—The receptive tip of the ovary. Grass florets usually have two stigmas.

Stolon.—A surface-creeping stem which generally roots at the nodes.

Tiller.—A sucker or branch from the bottom of the stem.

MAIZE VARIETIES

Trials at Orbost, 1941

By W. J. B. McDonald, B.Agr.Sc., Senior Plant Investigation Officer

MAIZE variety trials at Orbost this year possessed something of an interstate character in that four New South Wales growers, recognized as possessing outstanding strains of maize, were good enough to submit their varieties for trial alongside locally-produced strains. As usually happens, seed imported from New South Wales did not show the yielding capacity that past performances in its own district would lead one to expect, and this emphasizes the necessity for acclimitization of seed which local growers import for trial, before attempting to assess its worth.

The highest yield of 95 bushels per acre was given by the variety "Reid's Improved" from Mr. G. H. D. Russell.

The experimental trials were located on the property of Cr. Keith Lynn who, for several years, has co-operated with the Department of Agriculture in its investigations into problems connected with the maize crop. It is a matter of regret to this Department that, owing to labour difficulties, Mr. Lynn will not be able to conduct the maize variety trials during the coming season.

Recent surveys of Victorian maize-growing areas emphasize that Victorian growers cannot relax their efforts to select the best type of seed. There are still too many barren stalks or stalks which throw faulty and low-yielding cobs. For example, the check plots in last year's trial carried 10 per cent. of barren stalks, but despite this they out-yielded most of the varieties submitted for trial.

Growers are urged to pay rigorous attention to seed selection. It is pointed out that the correct way to select is from the plant standing in the field, and preferably from the middle of the crop where there is less chance of cross pollination. The selection of good-looking cobs from the crib may be very misleading.

The object of the Variety Trials is the recognition of those strains or varieties of maize present in the Orbost district which, over a series of years, regularly out-yield their neighbours when planted together under comparable conditions. In order to make this test as accurate as possible, each variety under trial is planted alongside a check plot of some standard variety, and it is the difference between any one variety and its corresponding check plot that is used to assess its merit in any particular season. This overcomes discrepancy in performance due to varying degrees of soil fertility. When picked, differing varieties show wide variations in moisture content. Yields, therefore, are given on a basis of 14 per cent. moisture content, following analysis by the Agricultural Research Chemist.

In the 1940-41 season, sixteen strains of maize were submitted for trial by fourteen growers, including four from New South Wales.

While it is not suggested that the value of any particular strain of maize can be determined on one year's trial, it is believed that if the same strains consistently appear among the top yielders over a series of years, these strains then possess particular virtues which make them worthy of a trial on every farmer's property.

Over a six-year period, there are several strains of maize that frequently appear as being among the four top yielders in any one season. The most consistent performers are Richardson's Cornplanter, J. W. Lynn's Funks Yellow Dent, Russell's Reid's Improved, John Lynn's Kruge Corn, Reynolds Bros. Goldmine, Keith Lynn's Hickory King, and McLeod's Silvermine.

It cannot be said that either white or yellow varieties consistently out-yield the other. In a season, such as 1937-38, white varieties performed better than yellow-grained varieties, while the reverse position held in a season such as that just past.

The total rainfall of 2,308 points received during the period October, 1940, to the end of May, 1941, was sufficient to produce a record crop had it been more evenly distributed over the growing period. As it is, crops generally have yielded well, but there were serious deficiencies in the rains received during October, 1940, when only 92 points were received and in March, 1941, when only 90 points fell. Had more generous rains been received in March crops would have been substantially better.

RAINFALL RECEIVED IN MONTHS OCTOBER, 1940, TO MAY, 1941.

Month.	Rain in Points.	Departure from Normal.
October, 1940	92	— 214
November, 1940	199	— 28
December, 1940	429	+ 129
January, 1941	666	+ 387
February, 1941	159	— 42
March, 1941..	90	— 357
April, 1941	553	+ 276
May, 1941	109	— 109
Total	2,318	..

PLOT RESULTS FOR 1939-40.

Grower.	Variety.	Yield.	Increase or Decrease over check plot.
		bus/ac.	
G. H. D. Russell ..	Reid's Improved ..	95·0	+ 1·6
John Lynn ..	Kruge Corn ..	90·4	—
J. W. Lynn ..	Funks Yellow Dent	93 1	— 0·6
Glen Innes, N.S.W.	Wellingrove ..	89·5	— 1·9
Jas. Warren ..	Early Morn ..	85·2	— 5·2
D. E. Timmins ..	Golden Glow ..	83·0	— 6·2
J. W. Lynn ..	Sunset Glow ..	82·6	— 6·5
Len Bower, N.S.W.	Murrumbidgee White	85·2	— 9·5
J. W. Lynn ..	Cornplanter ..	83·2	— 10·2
R. J. Goward, N.S.W.	Funks Yellow Dent	75·0	— 19·7
G. McLeod ..	Silvermine ..	71·8	— 20·0
K. Lynn	Hickory King ..	75·4	21·3
W. Russell ..	Cornplanter ..	72·4	— 22·2
W. Gribenow ..	Yellow un-named ..	69·8	— 23·2
Toby Nixon ..	Goldmine ..	68·8	— 24·2
L. D. Collet, N.S.W.	Hickory King ..	63·6	— 33·4

Trials were planted in ground which was pasture in 1937-38, grew a crop of beans in 1938-39, and a crop of maize in 1939-40. Check plots were sown with Funks Yellow Dent.

Leading Varieties 1934–35—1940–41.

1934–35.—M. Richardson's Cornplanter (1); H. McLeod's Silvermine (2); M. Richardson's Red Hogan (3); Reynolds Bros. Goldmine (4).

1935–36.—Reynolds Bros. Goldmine (1); H. McLeod's Silvermine (2); Irvine and Richardson's Cornplanter (3); K. Lynn's Hickory King (4).

1936–37.—Irvine and Richardson's X Bred (1); G. H. D. Russell's Reid's Improved (2); J. W. Lynn's Funks Yellow Dent (3); Irvine and Richardson's Cornplanter (4).

1937–38.—Keith Lynn's Hickory King (1); Warren Bros. Golden Nugget (2); J. H. Nixon's Manning River White (3); A. D. Richardson's Cornplanter (4).

1939–40.—J. W. Lynn's Funks Yellow Dent (1); M. Johnston's Reid's Improved (2); John Lynn's Kruge Corn (3); J. W. Lynn's Cornplanter (4).

1940–41.—G. H. D. Russell's Reid's Improved (1); John Lynn's Kruge Corn (2); J. W. Lynn's Funks Yellow Dent (3); "Wellingrove" from Glen Innes, N.S.W. (4).

NOTE.—Variety plots were not planted in 1938–39.

The Grazing of Pasture Lands

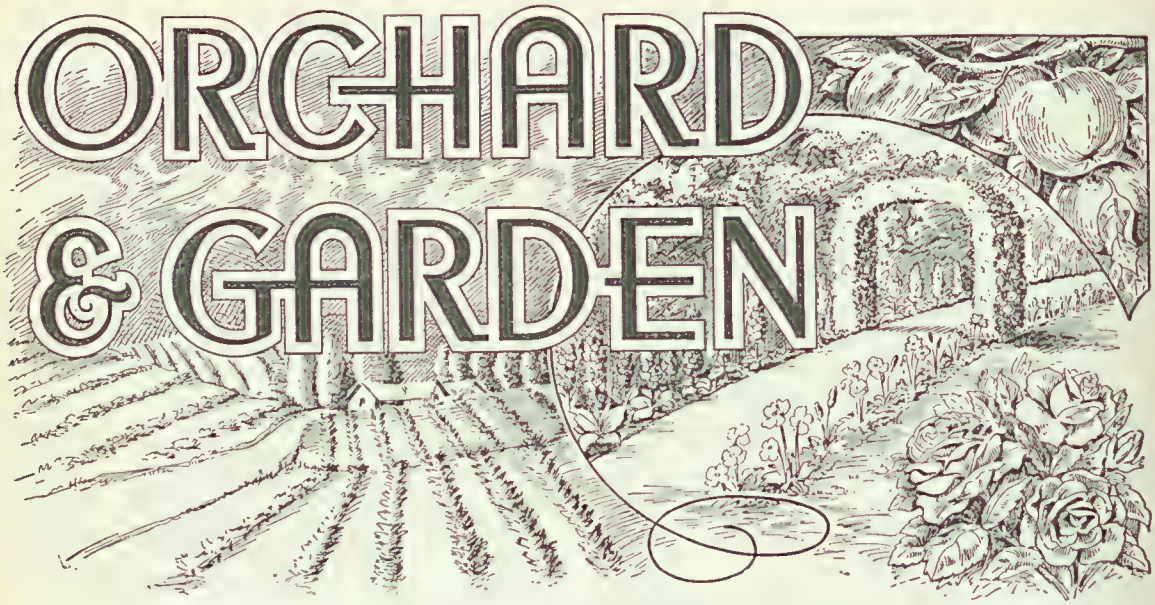
Pastures should not be grazed continuously. The growth of a plant depends upon processes which go on in the leaves and, if a plant is always kept short, obviously it cannot be as productive as one that is given a chance to recover from hard grazing.

The leaf is the laboratory of the plant, because it is by the leaf pores that the plant is able to take in gases from the atmosphere to build up its tissues.

Investigations have shown that the most satisfactory system of grazing is to shut the paddock up for three or four weeks before allowing the stock access, and so give the sward a chance to strengthen.

But remember that a sward which grows too long becomes rank and unpalatable to stock, and falls off in nutritive value. That deterioration is not offset by the greater bulk of feed. Herbage left late in the summer to lodge and rot may become entirely useless.

It is a wise farmer who regulates his grazing by changing his stock from paddock to paddock and giving the sward in each area a chance to recover.



In the Orchard

By J. L. Provan, B.Agr.Sc.,
Senior Horticultural Instructor

THE losses from codling moth last season will make growers realize the necessity for applying sufficient and thorough applications of spray in the early part of the season. It was very noticeable that where growers omitted sprays, or where sprays were applied carelessly, codling moth gained a fresh foothold in the orchard. This build-up of population will require very strenuous efforts on the growers part to reduce it to commercial limits. Those growers who have already practised thorough orchard hygiene throughout the winter months have gained an advantage over their neighbours. Last season, many growers omitted to bandage the trunks of their fruit trees, and this omission certainly added to the codling moth population in the orchard. On many of the demonstration plots, by rigid attention to orchard hygiene and bandaging, the number of sprays applied throughout the season has been considerably reduced without increasing the percentage of infected fruit. The bands should be placed in position about the middle of November. Where labour is available, hessian bands should be preferred, particularly on pear trees. Such bands will require inspection and cleaning every ten days, and it is very important that loose bark on the trunks of the trees should be scraped off before the bands are applied. Where there is a scarcity of labour, chemical bands will materially reduce codling moth infection. Growers are urged to attack this pest during November and December. The peak emergence of moths usually occurs in the first or second week in November, and a spray should be applied from ten to twelve days after this time. This Department is maintaining the spray advice circular system, and information concerning the emergence of codling moth will be posted in prominent places throughout the fruit-growing districts, and circulars will be forwarded to growers in the districts in which this method of advice has been used in the past.

Towards the end of November, canning peaches should be sprayed with a dry-mix lime sulphur for the control of brown rot. It is particularly important that an efficient agitator should be working in the spray vat to ensure that the active ingredients are sprayed on the trees. Early dessert peaches should be sprayed with a wettable sulphur at the rate of 4 lb. per 100 gallons at the end of this month.

To ensure an adequate and even distribution of water where orchards are irrigated, and to prevent excessive watering, it is essential that the grower should use a soil auger to inspect the sub-soil. The soil on many orchards is so variable that without an auger it is impossible to ascertain what are the irrigation requirements. Adequate irrigations in the early part

Flood irrigation of pear trees in the Goulburn Valley.

of the season are important from the point of view of fruit setting. Trees which do not receive sufficient moisture tend to drop their fruit to a greater extent than those which are watered correctly. The use of the soil auger enables the grower to determine, very quickly, the depth of penetration, and also the lateral spread of water through the soil. By testing the lateral spread, he is enabled to decide the number of furrows necessary. Particular attention should be given to the headlands and footlands of the irrigation run. Very frequently these areas are over- or under-irrigated. Long irrigation runs should be avoided by making temporary head ditches, across the lands, every 4 or 5 chains apart. In the lighter types of soil, underground pipe systems are becoming very popular. Such systems provide stand-pipes, with valves, by which the water can be easily and accurately regulated.

Young orchard trees which have been set out during the winter will be benefited by the application of a mulch of some bulky form of organic manure, such as stable, cow, sheep, or a light dressing of strawy poultry manure. Where these forms of manure are unavailable, a mulch of weeds or grass, old straw, or old hay, will be found useful. The advantage of this mulch is that the surface soil is kept cool and moist, and this condition assists in the establishment of the young tree's root system. It will be found particularly useful on hot, dry, sandy soils, but it will also help in the establishment of trees on other soil types. Young trees will also require protection from rabbits, and the trunks of young citrus trees should be protected from the sun by wrapping them in several thicknesses of paper or enclosing them in straw envelopes.

In the Garden

By A. W. JESSEP, M.Agr.Sc., B.Sc., Dip. Ed., Principal, School of Horticulture, Burnley

PREPARE the ground ready to plant out the main batch of dahlias about the end of November. Aphis and mildew are likely to be attacking roses, delphiniums, and similar plants, and it is advisable to treat the roses with nicotine sulphate and soft soap against the aphis and dust them, and to treat delphiniums with flowers of sulphur or some other suitable preparation to keep down the mildew.

SUMMER ANNUALS.

Preparation now should be well in hand for the transplanting of the summer annuals. Plant out any of the following:—

Ageratum, aster, celosia, clarkia, cornflower, cosmos, dianthus, gaillardia, marigold, nicotiana, bonfire salvia, and zinnia.

Sow seed of the following where they are to grow:—

Phlox, portulaca, nemesia, lupin, and mignonette.

The Zinnia.

For a continuous floral display throughout the summer and autumn, the zinnia is probably the best of the annuals. The seed should be sown in October and the seedlings transplanted in November. Select a good, open, sunny position, and throughout the growing period do not overwater. Keep the area somewhat dry, but well hoed to prevent an excessive loss of water. If watered too freely, stem rot is likely to develop.

The flowers vary in colour from yellow through various shades of orange to crimson. They tone in well with marigolds and similar flowers, and are very useful for indoor decorations. The plants vary in height from 6 inches or so to tall growing varieties of 3 feet and more. The dwarf varieties are excellent for borders, and the large types are very good for massed effects.

The small types should be planted about 6 to 8 inches apart, the large one 18 inches, and the intermediate sizes about 1 foot between the plants.

There are several varieties, and the following are good standard types:—

Lilliput Tom Thumb is a dwarf Lilliput variety that grows 6 inches or so in height, produces small button-like flowers, and is used as a border plant.

Lilliput, various colours, are more robust and grow about 1 foot in height. The flowers are button-like in appearance, may be obtained either in separate or in mixed colours, and are used as border plants.

Linearis is a dwarf yellow variety, suitable for borders.

Haageana is another small-flowered border type.

Desert Gold is a taller growing variety, and produces large flowers with dual tonings of orange.

Fantasy is a large type, but the flowers are more decorative than most others and in various tones of crimson, orange, and yellows.

Dahlia, flowered, is one of the most popular types, and includes such varieties as Lemon Beauty, Old Gold, Luminosa (pink), and Scarlet Flame.

Vegetable Growing.

With the warmer weather, the soil around the growing vegetables should be well hoed to form a mulch to help to prevent the excessive loss of moisture by evaporation.

A liberal dressing of farmyard manure should be applied to the rhubarb and asparagus beds, and the frond of the asparagus should be allowed to develop from now onwards. Water the growing vegetables as required, giving them a liberal supply at intervals and not merely a light sprinkling every day or so. Make further plantings of French and climbing beans, Greenfeast peas, lettuce, radish, turnips, and parsnips. It is not too late to sow cucumbers, melons, and pumpkins.

The pumpkin family produces some very useful vegetables, including squashes, marrows, and pumpkins. These vegetables grow very well in an average soil if given a good sunny position and a liberal supply of water.

With pumpkins and squashes, it is usual to sow about three to four seeds in a clump with about 8 feet square between each clump. Pumpkins are not used until mature. This stage is indicated by the hard skin, and, if necessary, pumpkins may be left on the vine until it dies back. When harvesting they should be handled carefully. The stalk should not be removed. Place them in a shed protected from the weather, and they should keep for months. Good culinary varieties are Ironbark, Triamble, Queensland Blue, and Turks Cap. Popular squashes include the Blue, Green, and Golden Hubbard.

The vegetable marrow is divided into two groups, the bush and the running or vine type. The former are planted about 4 feet apart and the running type 6 to 8 feet apart.

The marrow is eaten in the immature stage and before the outer skin is very hard. It does not store well. The bush types most commonly grown include the Early Long Green, Early Long White, and Custard. The running type includes Long Green Running, Long White Running, and Marblehead.

Fruit and Vegetables in the Diet

By Rachel M. Peile and Mary D. White, Fruit Preserving Experts

Thrifty and prudent management of the home has ever been an attribute of the good housewife. She practises economy without parsimony, and budgets carefully for the future. The home is such a community in itself that budgeting for all its requirements covers a wide field, and presents no easy task, as anyone who has kept house will verify.

THE importance of fruit and vegetables in the diet has become widely recognized in recent years. The term "balanced diet" used so commonly nowadays means, simply, that the various types of food are taken in the correct proportions. In Australia, there is little likelihood of deficiency of proteins or body builders, owing to the relatively high consumption of meat. Heat and energy-producing foods, containing starch and fat, such as bread, cakes, and pastry, are almost always present in sufficient quantity—often in too high a proportion. These foods provide the largest part of our diet.

Frequently, however, diet is lacking in one or more of three other types of food, namely, those containing minerals, vitamins and roughage or fibre. In most cases, there is sufficient of these substances to prevent deficiency diseases, but insufficient for good health. Roughage or fibre is the fibrous part of fruits and vegetables. This roughage acts as bulk in the intestines, preventing constipation.

The most important minerals are calcium for bones and teeth; iron for the blood; iodine for the proper functioning of the thyroid gland, and phosphorus for the body cells. These minerals are found in green, leafy vegetables, such as spinach, cabbage—particularly the outer leaves—silver beet, sprouts, lettuce, and turnip tops, and in lesser amounts in fruits and root vegetables. In regions like Gippsland and Tasmania, where the soil is poor in iodine, the fruits and vegetables are also deficient in that mineral. In most methods of fruit and vegetable preservation, little mineral is lost.

Vitamins, substances essential for health, even for life itself, are found in fruits and vegetables, particularly when freshly picked and raw. By careful cooking and preserving, the loss of vitamin content can be greatly reduced. Prolonged heating will destroy most vitamins, particularly if they are heated in the presence of air. Addition of bicarbonate of soda also destroys vitamins.

In bottling fruit, if fresh, first quality fruit is used, and if processed in the absence of air for a short period at boiling point, the resulting product should retain most of its vitamins. In storage, preserves should be kept in a dark place, as light will destroy colour and reduce vitamin value. In vegetable bottling, bleaching with boiling water should be avoided as it will greatly reduce the amount of vitamins. Intermittent sterilizing in the absence of air is the best home method.

Jams, jellies, marmalades and butters, owing to long heating in the presence of air, lose most of their vitamins, although the minerals are retained.

Dried vegetables and fruits are lower than fresh in vitamin content, and cannot be considered as a complete substitute. Dried vegetables are useful for soups and flavouring when fresh ones are unobtainable. Dried peas can be germinated, then used. If this is done, the vitamin content will be greatly increased. The sulphuring process improves colour and protects dried fruit and vegetables from insects but increases destruction of vitamins.

Pickled vegetables may contain vitamin. Sauer kraut or pickled cabbage is an example. Generally, acidity due to the presence of a large quantity of vinegar, and the presence of condiments which often act as irritants, make pickles less useful as a food than bottled vegetables. They should not be given to children, and should be used sparingly by adults.

Candied and crystallized fruits, because of repeated heating and extraction of juice, lose most of their food value. They are useful to replace sweets or as decorations, making foods attractive in appearance.

Where possible, the daily diet should include fresh fruits, such as apples and oranges, a fresh salad, tomatoes, celery, lettuce, a root vegetable, a leafy green vegetable and potatoes. Where freshly picked raw fruits and vegetables are unobtainable, bottled products may be used instead. These products, if carefully prepared, are preferable to cold storage foods, which gradually lose vitamin content. Stewed and dried fruits should be used in the menu, but not wholly to replace the fresh product.

Bottled fruits and vegetables are of value in replacing fresh products when the latter are scarce or unobtainable and also to provide variety in the menu.

Budgeting for a Family of Five

ONE way in which savings may be effected and provision made for a period of the year when supplies are scarce or unobtainable, is to plan in the flush of the fruit and vegetable seasons what quantities of these products can be preserved for the year's requirements. A considerable amount of money can be saved in this way, especially if the produce is bought in quantity. It is even better, however, to grow whatever fruit and vegetables will be required in the home garden. In addition to being fresher than the purchased article, the produce costs nothing but the labour. For good results in preserving, the best quality and freshest fruits and vegetables are essential. If the garden will not supply all requirements, they may be obtained locally from a grower or a nearby market.

In certain districts it is very difficult to obtain vegetables during some seasons of the year, and it is then that bottled, dried and pickled produce is most valuable.

Wherever possible, variety is desirable. If a large quantity of one kind of fruit is available, it may be used in various ways. For example, peaches may be bottled, used for jam, or in fruit salad; apples may be made into apple marmalade, apple ginger, chutney, pulp, or they may be dried.

In budgeting, the tastes of members of the family, the climate, and the type of meals served must be considered. No definite rules therefore can be laid down, but the following suggestions may be helpful to housewives.

Fruit juices can be prepared as syrups to be used in milk drinks or sundaes. Children, averse to drinking plain milk, will take it more readily when flavoured in this way. Luncheon spreads or butters are useful for children's lunches. Orange and lemon peel, which otherwise would be wasted, can be made into marmalade or candied peel. Shredded and dried root vegetables make a good substitute in soup for the fresh article. Herbs, such as mint, can be dried for use in winter.

Apples and pears are always popular and plentiful. They can be preserved in many different ways and will provide further variety in the daily menu.

Details are given hereunder, of a preserved fruit and vegetable budget for a family of five persons, for one year. In addition, recipes are given of four different ways in which fruit may be used.

FRUIT AND VEGETABLE PRESERVING BUDGET FOR A FAMILY OF FIVE PERSONS

Jams.

Apricot	6 lb.
Fig	4 „
Peach and Pine	6 „
Plum	6 „
Apple Ginger	6 „
Raspberry	6 „
Melon and Lemon	8 „

Marmalade.

Grapefruit	6 lb.
Carrot	6 „
Orange Peel	4 „
Apple	6 „
Seville	6 „

Jellies.

Apple	6 lb.
Grape	6 ,,
Mint	6 ,,
Loganberry	6 ,,

Bottled Fruits.

Apple Pulp	20 lb.
Pears	15 ,,
Plums	15 ,,
Cherries	10 ,,
Peaches	15 ,,
Quinces	10 ,,
Apricots	15 ,,
Gooseberries	10 ,,
Fruit Salad	8 ,,

Bottled Vegetables.

Tomato Pulp	25 lb.
Peas	14 ,,
Beans	14 ,,
Soup Mixture	8 ,,
Beetroot	8 ,,

Pickles.

Onions	6 lb.
Mustard Pickles	6 ,,
Apple Chutney	5 ,,

Sauce.

Tomato	20 lb.

Juices and Syrups.

Tomato Juice	12 lb.
Raspberry Syrup	8 ,,
Lemon Syrup	6 ,,
Apple Juice	16 ,,
Passion Fruit Syrup	4 ,,

Spreads.

Lemon Butter	4 lb.
Apple Butter	4 ,,
Apricot Butter	4 ,,

Candied Peel.

Orange	1 lb.
Lemon	3 ,,
Grapefruit	1 ,,

Drying.

Soup Vegetables	10 lb.
Herbs	3 ,,
Apples	20 ,,

In Storage Pit.

Carrots.
Turnips.
Any Surplus from the garden.

N.B.—Weights given are for raw fruits and vegetables.

Recipes

Apple Pulp.

Peel and core apples, add sufficient water to prevent burning, and cook gently to a pulp. Sterilize jars, rubber rings and lids over steam, or by putting into warm water and bringing to the boil. If tins with press-in lids are used pour boiling water in. The spoon may be sterilized with boiling water. Stand jars on a damp cloth and fill with the boiling pulp, sealing immediately.

Banana and Pear Jam.

6 lb. bananas.
2 lb. pears.
Juice of 2 lemons.
5 lb. sugar.

Peel, core and slice pears; peel and slice bananas. Put fruit into a preserving pan and sprinkle a little sugar over it, also the lemon juice. Add just enough water to cover the bottom of the pan and simmer with the lid on until the fruit is cooked. Add the remainder of the sugar and boil rapidly until a good colour and consistency.

Apple and Rhubarb Jelly.

Use one pound of rhubarb to two pounds of apples. Wash and cut up apples, cover with water and simmer very gently. Wash rhubarb, cut up roughly, taking care not to remove the outer stringy part, and add to the apple. Continue cooking gently till fruit is quite soft (about ¾ hr. to 1 hr.). Then strain, measure, and add an equal measure of sugar. Boil till it gives the test.

Dried Apricot Butter.

¼ lb. dried apricots.
2 eggs.
¼ lb. sugar.
2 oz. butter.

Wash apricots and soak overnight. Skin if preferred, and stew in a little water until tender. Mash through a sieve. Beat eggs and add eggs, butter and sugar to apricots. Double boil, stirring well, till thick. Put into small jars or pots.

The Selection and Maintenance of Starter Cultures for Cheesemaking

3.—Care and Management of Starters in the Factory.

By T. M. JENSEN, B.Agr.Sc. (N.Z.), Principal, School of Dairy Technology, Werribee.

AT the present time, methods of starter propagation vary considerably from factory to factory. The various procedures adopted have no doubt originated from the ideas of individual cheesemakers, each of whom, according to his own particular experience, has stressed one point or another to the exclusion of points that would be considered important by others. The relative effectiveness of the different methods has been difficult to judge owing to the fact that on some occasions starters will behave quite normally under practically any treatment, while on other occasions and under apparently the same conditions, their behaviour will be most erratic. One fact abundantly clear, however, is that none of the methods devised has enabled the cheesemaker to secure complete control over the behaviour of his starter.

Progress towards this goal has been retarded by the lack of information which existed until recently regarding the fundamental causes of starter failures, but discoveries during the last two or three years have largely overcome this deficiency, and new light has been thrown on some details of management, the importance of which had not previously been recognized. Two aspects which have assumed particular importance are the location of the starter room and the use of mother cultures. In the present article it is proposed to devote special attention to these features, before proceeding to outline essential details in the practical propagation of starters.

The Starter Room and its Location.

The provision of a separate starter room within the factory building to be used solely for the purpose of starter-making has long been regarded by some cheesemakers as an essential feature in cheese factory design. In a rather indefinite sort of way it has been realized that such a room, if kept in cleaner condition than other parts of the factory, provides better surroundings for the starter, and assists in reducing the risks of contamination to a minimum. Recently acquired knowledge regarding the mode of contamination of starters by bacteriophage has now made it clear that one of the most essential features in the management of starters is the necessity for protecting the cultures from the phage-laden atmosphere of the factory. As a result, the purpose of the starter room and also the matter of its location at the factory have taken on a new significance.

The immediate source of phage within a factory is, as explained in an earlier article, the whey from the cheese vats. Phage from this source spreads about the factory, and becomes disseminated into the air to an extent depending largely upon the manner in which the whey is handled after removal from the cheese vats. Careful study on this point in New Zealand has shown that where a whey separator is in use a "whey mist" is created within the factory each day by the atomizing effect of the separator upon a portion of the discharging whey. The finely divided particles of whey in this mist remain suspended in the air for several hours, during which time they may permeate into all parts of the building with which there is communication by air.

In such an atmosphere, the concentration of air-borne phage may become so high that the use of an ordinary bacteriological aseptic technique will be inadequate to prevent phage-infection of the starter from the air. Consequently, where it is the practice to separate whey, measures may have to be taken to prevent the entrance of air-borne phage into the

starter room in order that a pure atmosphere may be obtained in which starter cultures can be handled without danger of phage infection.

Investigations into the best methods for putting this principle into practice have been in progress in New Zealand for some time. A number of different procedures has been tried, but the only completely satisfactory method developed to date consists in the provision at some distance from the factory of a detached starter room of dust-proof construction. With this arrangement, air-borne phage moving towards the starter room is dissipated in the open air between the two buildings, and any small amount which may chance to reach the starter room is unable to gain access to the interior owing to the construction.

Naturally, the further the starter room is removed from the factory the greater the insulating effect is likely to be, but in practice the distance between the two buildings will be governed to some extent by the matter of convenience in transporting the cans of starter. Trials lasting over a complete season have shown that the use of such a room, together with precautions to avoid phage infection from the worker and gross contamination of other kinds, will enable complete control over the behaviour of starters to be maintained indefinitely.(1)

These findings are now being adopted commercially both in New Zealand and Australia, but it will be clear that the necessity or otherwise for a detached starter room at any particular factory will depend entirely on the results experienced at that factory in maintaining single-strain starters under ordinary conditions. If experience at the factory has shown that these starters can be maintained without difficulty by the use of ordinary methods, then, obviously, no additional precautions against air-borne contamination need be taken, and it may be assumed that some factor is automatically operating to keep the concentration of air-borne phage in the starter room below the danger level.

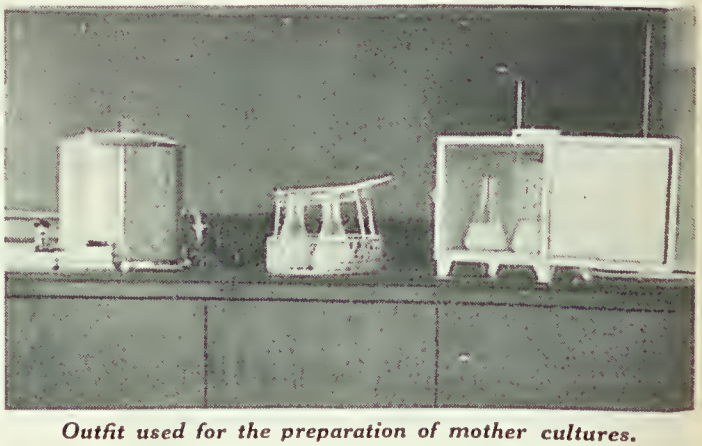
If, on the other hand, phage failures have proved unavoidable no matter how careful the technique employed, it may be taken for granted that phage-infection from the air is responsible, and that measures to avoid this type of contamination will be necessary if the trouble is to be overcome. In such a case the nature of the measures required may again depend, to some extent, on the degree of trouble experienced. Thus, if phage failures have been found to occur with sufficient frequency to constitute a serious problem, the erection of a detached starter room is likely to prove the only satisfactory solution; but if failures are relatively infrequent and spasmodic in occurrence the adoption of some simpler alternative arrangement may suffice to reduce the trouble to negligible proportions if not to eliminate it entirely.

Any arrangement which assists in protecting the starter from air-borne phage affords a measure of relief from phage failures, and it would appear that considerable benefit could be derived in some factories from shutting off the existing starter room as completely as practicable from the making room. This would involve sealing up the present doorway leading from the starter room into the making room in favour of a doorway opening on to the exterior of the factory, and making the ceiling and walls of the starter room as dust proof as practicable. Failing this, steps should be taken to at least have the whey separator located as far away as practicable from the starter room door and to keep the latter shut as much as possible. The suggestion has been made also that further protection of the bulk culture should be possible to some extent by making airtight the lids of the cans in which the culture is prepared, and providing a small opening plugged with cotton wool through which the milk can be inoculated. While this would no doubt reduce the chances of direct phage infection of the bulk culture from the air, it must be emphasized that the practice is likely to be of little benefit unless the atmosphere in which the mother culture is handled is free from phage; for whereas the bulk culture may be prepared under conditions which permit of a slight contamination with phage, the mother culture must be completely protected, since any trace of phage in it ultimately destroys the starter.

Other methods of protecting starters from air-borne phage will no doubt be developed as time goes on, but the information already given will be sufficient to explain present conceptions regarding the function of a starter room and to indicate the factors which govern its efficiency.

The only additional point which needs to be mentioned regarding the design of the starter room is that, for the sake of convenience in

handling the cultures, the room should be divided into two compartments, one for preparing the bulk culture and the other for propagating the mother culture.



Outfit used for the preparation of mother cultures.

The Use of Mother Cultures.

Although the mother cultures in one form or another are now used in most cheese factories in the daily propagation of starters, misconceptions with regard to the true nature of a mother culture and in respect of the essential features of its propagation are so common that some clarification of ideas on the subject seems to be necessary.

A mother culture may be defined as a small culture kept under more rigorously controlled conditions with respect to temperature and freedom from all types of contamination than is possible with the bulk starter. It serves as a starting point for each propagation of the bulk starter, and the fact that it is kept under very carefully controlled conditions and independently from the bulk culture means that if some mischance happens to the latter on any one day the starter is not permanently spoiled or lost, but that only one day's make is adversely affected; a fresh bulk starter is made up the next day from the mother culture which is as active and clean as ever.

The old practice, still followed in many factories of keeping some starter from the main bulk for setting off the next day's bulk starter is unsafe, and cannot be recommended as good practice. Starter culture transferred from a can to another vessel and held in the factory before re-sowing into another batch of milk is subjected to more risk of contamination than is a culture held in a closed flask up till the time it is required for inoculating. Admittedly, starters are often maintained by this method for long periods at a time, but, as a general rule, they will contain contaminating bacteria after a week or two, or suffer a loss in activity due to phage infection. Another common practice is to dip a portion of the starter milk out of one of the large cans just before setting, and to pour this milk into a jar or thermos flask; this jar of milk is then set from the previous day's so-called mother culture before the latter is used to sow the main bulk of starter milk. Here, again, it is doubtful whether a culture prepared in this way can be called a "mother culture" in the true sense of the term. The milk poured into the jar or thermos flask is actually subjected to more risk of contamination than the milk in the large cans, especially if phage is present in the atmosphere. To fulfil its function properly a mother culture must be handled by much more careful methods, and prepared quite independently of the bulk starter; that is to say, the milk for the culture must be pasteurized and cooled in the flask in which the culture is to be grown, and inoculation must be carried out with rigid aseptic precautions in an atmosphere free from phage.

In some places the further refinement has been introduced of carrying still smaller mother cultures in test tubes of steamed milk, these test-tube cultures being used to inoculate a flask culture from which the bulk culture is sown. This represents an endeavour to maintain starter cultures under laboratory conditions in the factory. However, where suitable precautions are taken in the propagation of flask cultures and where a periodical supply of fresh cultures is obtainable from a central laboratory, further refinements in propagating mother cultures may be dispensed with. Stock cultures can be more conveniently kept at a central laboratory, and under this system a check can be kept on the vitality of the cultures before they are despatched to factories.

Equipment Desirable for Propagating Starter.

The successful propagation of starters requires systematic and careful work and unremitting attention to details of cleanliness and temperature control. A satisfactory routine can be maintained much more easily

if certain equipment, simple but adequate, is provided. In addition to a starter room incorporating the features already discussed, the following items of equipment are recommended:—

Mother Culture Outfit.

1. The most suitable vessel to use in making up mother culture is a conical glass flask of 1 litre (1,000 c.c.) capacity, as illustrated in the accompanying photograph. The small mouth assists in reducing the exposure of the culture to a minimum when the cover is removed for sowing. If thin-walled Pyrex glass flasks are used, they will withstand sudden changes in temperature better than will thick-walled glass containers.

2. Some means of heating the milk and cooling it in these flasks is necessary. A sheet-copper or tinned-steel steamer, as illustrated, is most convenient and effective. It should be fitted with steam and cold water connexions and should be large enough to allow the lid to be replaced after the flasks have been placed inside. If the necks of the flasks have to be left protruding from the steamer it is doubtful whether they will receive sufficient treatment to destroy all contamination. Heating may be carried out by standing the flasks in water up to the level of the milk and blowing steam into the water, but a better plan is to use no water and to heat the flasks by means of flowing steam. Steam then surrounds the flasks and their covers completely, and all parts of the vessels and their contents are brought up to the temperature of the steam. A cold water lead to the steamer and an overflow fitted at the proper level enables the flasks to be cooled off without the necessity for removing them to another vessel. For the sake of convenience, the steamer should be mounted on the bench in the mother-culture room.

3. Provision should be made for a supply of pipettes for sowing the cultures and for a means of sterilizing the pipettes. Straight glass tubing $\frac{3}{8}$ in. in diameter, of a suitable length, and calibrated to deliver the required amount of inoculum, serves quite well as a pipette. A cylindrical sheet-copper container fitted with a lid is desirable for holding the pipettes during sterilization and for storing them ready for use. Sterilization of the pipettes in this container may be carried out in a hot air oven (such as the ordinary household oven) by heating to at least 300° F. for not less than one hour. The pipettes must remain in the container with the lid attached until required for use. If two such containers and an adequate number of pipettes are provided, a supply of sterile pipettes can be easily maintained at all times.

4. A means of maintaining the flasks at constant temperature while the starter is growing is necessary. Practices such as placing the flask by the boiler or standing it in a large bulk of water as with the main starter are sometimes adopted, but these methods rarely give proper control over the temperature. For the best results an insulated cupboard, fitted with a heating device and a thermostatic control, is necessary. Incubators of this type, heated by electric light bulbs, are on the market and are quite satisfactory in ensuring that the temperature of the culture does not fall below the desired point. However, they will not prevent the temperature in the incubator from rising above the desired point if the atmospheric temperature should exceed this. For this reason the incubator must either be placed in a position where the atmospheric temperature is never higher than that at which it is desired to incubate the culture, or artificial cooling of some kind must be provided.

Bulk Starter Equipment.

The best types of vessel to use in making up the bulk starter are stainless-steel or well-tinned steel cans. The lids should preferably be of the overlapping type to prevent any chance of moisture on the top of the lids draining back into the cans after the milk has been heated. The tub in which the cans of milk are heated should be deep enough to allow the water to be brought up to the level of the milk in the cans so that the top portion of the milk may be properly heated and cooled without the necessity for stirring. A cover on the tub is an advantage as it enables the tops of the cans to be more effectively treated and helps to cut down heat losses.

The tub should also be fitted with cold water and steam inlets at the bottom, a plug which permits of complete draining, and a water overflow of adjustable level. The larger the bulk of water held by the tub, the higher are the steam requirements for heating, but the easier it is to maintain a constant temperature while the starter is growing.

A rather common type of outfit in which the tops of the cans are left protruding above the top of the heater and stirrers are fitted through the lids of the cans cannot be recommended. Stirrers are not only unnecessary but any attempt to use them after the milk has been pasteurized may result in recontamination of the milk.

Procedure Suggested for Propagating Starter.

Assuming that equipment the same as, or similar to, that recommended is available, and that the milk for starter-making has been selected in accordance with suggestions made in an earlier article, a procedure which will take account of all essential points and at the same time avoid unnecessary detail is as follows: —

Mother Culture.

A number of conical glass flasks sufficient to hold the required amount of mother culture is thoroughly cleaned by washing in hot soapy water and rinsing out. Each flask is then about half filled with milk and covered by plugging the neck with non-absorbent cotton wool. The flasks are then treated with flowing steam for 45 to 60 minutes in the closed steamer. Thermometers should not be inserted into the flasks either during or after the heating process. When heating is completed the flasks and their contents are cooled, preferably in the steamer itself by allowing cold water to flow through. A convenient practice is to turn the cold water off while the flasks still feel slightly warm to the touch and to adjust the temperature of the water surrounding the flasks to 75°F. It is necessary then to let the flasks and their contents stand in the water at this temperature until they have reached equilibrium with the water temperature. On no account should a thermometer be inserted into the flasks to ascertain when this has occurred. Such a practice is quite unnecessary and is bound to result sooner or later in gross contamination of the mother culture. The cottonwool plug should not be removed from the flask throughout the heating or cooling processes nor disturbed when the flasks are transferred from one place to another.

After the flask has stood in water at 75° F. for an hour or more the mother culture is ready for inoculation. The following procedure is recommended:—

1. The operator, after washing his hands and arms and drying them on a clean towel, dons a clean smock or overall and sets out the following apparatus on a freshly-cleaned bench in the mother culture room:—

(*a*) the flask of freshly-sterilized milk.
(*b*) the flask containing the thick mother culture (from the previous inoculation).
(*c*) the cylindrical tin containing the sterile pipettes.

2. The thick mother culture is broken up by giving the flask a rotary motion on the bench, care being taken not to splash the culture up into the neck of the flask.

3. The cover of the pipette container is removed and placed on the bench and a pipette is removed from the container with the right hand, care being taken not to allow the tip or any of the lower part of the pipette to touch anything.

4. While the plug of the thick culture flask is removed with the left hand and held just clear of the neck of the flask, the pipette is inserted into the flask and 5 to 6 cubic centimetres of the thick culture are drawn up. The pipette is withdrawn and the plug immediately replaced.

5. The plug of the sterilized milk flask is withdrawn just clear of the neck with the left hand, the pipette containing the culture inserted into the milk, and the culture allowed to flow into the milk. The pipette is then withdrawn and the plug immediately replaced.

6. The inoculated flask is placed in the incubator at 75°F. It is not shaken or touched in any way until everything is ready for resowing on the following day. The cover of the pipette container is replaced and the container itself is kept in a dry place until again required.

The remainder of the flask of clotted culture is now available for sowing the bulk culture.

The Bulk Culture.

The required number of cans is cleaned by brushing and rinsing. A suitable quantity of milk is placed in each can, which is then placed in the tub and fitted with a lid. The water level in the tub should be just above the milk level in the cans. The steam is turned on and the water is boiled for 45 to 60 minutes from the time boiling commences. The hot water is then run off and cold water is allowed to flow through the tub until the cans are just slightly warm to the touch. A few trials with a canful

of water will soon show the length of time the cooling water needs to flow so that when it is turned off the contents of the can and the water in the tub automatically reach equilibrium at a temperature of about 72°F. after a period of standing. The temperature of the water in the tub is then adjusted to 75°F. by blowing a little steam into it and the cans are allowed to remain standing thus for about another hour before they are inoculated. This ensures that the milk is at a temperature in the vicinity of 75°F. when inoculated. At no time is the lid removed from the can during the heating and cooling processes, and it will be noted also that the use of a stirrer is deliberately avoided.

To inoculate the cans, the flasks of thick culture are brought to the tub and the lid of each can is lifted in turn just sufficiently to allow the neck of a flask to be inserted above the mouth of the can. From a half-pint to one pint of culture (i.e., about 1 per cent.) is poured into a can containing 10 gallons of milk and the lid is immediately replaced. The water in the tub is maintained at 75°F. until the last man leaves the factory in the evening.

Liquid cultures, when received from a laboratory, should be handled with the same care as the mother culture. The cork should be carefully withdrawn, a sterile pipette inserted, and a few cubic centimetres of the culture transferred to a flask of freshly-sterilized milk. The resulting culture should be clotted and ready for use on the following day.

Reference.

(1) Whitehead and Hunter, J.D. Res. 12: 63.

***Live Stock Notes*—continued from page 547.**

When the disease has been definitely diagnosed in calves, stock owners are advised to vaccinate against it, using the same vaccine recommended for sheep. Directions for the use of the vaccine, dose rates, &c., may be obtained on application to the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2. The vaccine itself may be obtained from the Commonwealth Serum Laboratories, Parkville, N.2.

When it has been found that very young calves are dying from entero-toxaemia, consideration might well be given to the vaccination of cows during pregnancy, so that some immunity may be transmitted to the calves in the milk of their mothers.

Worms in Stock.

Worm infestation in animals is apparently even more prevalent than usual in certain districts in Victoria this season. Many queries have been received in regard to the use of phenothiazine, which has given excellent results in most animals, particularly sheep. This drug, however, is at present somewhat difficult to obtain, but its use for animals is outlined in the August number of this *Journal*.

Stock owners troubled with worm infestation in any of their animals are advised to communicate with the Chief Veterinary Inspector, when full instructions in regard to control measures, together with literature dealing with the various types of animal parasites will be forwarded.

Foot Louse in Sheep.

The foot louse (*Linognathus pedalis*) is a sucking louse, and, although by no means as common as the red-headed, biting, sheep louse, is apparently becoming more prevalent in this State.

The foot or leg louse is rather more difficult to control as it is somewhat resistant to the arsenical and carbolic dips employed to eradicate the biting louse.

To remove foot lice in sheep, the use of proprietary dips containing derris or rotenone is advised, or alternatively, a solution of nicotine sulphate, 1 part in 800 parts of water, has proved effective. It is not necessary to completely immerse the sheep, the bath should be just deep enough to cover the infested parts. The sheep should be held in the bath for five minutes, and the treatment should be repeated three times at ten-day intervals.

W. D. Shew, G.M.V.C., B.V.Sc., Senior Veterinary Officer.

Tubercle Free Herds

The following herds have been declared free of tuberculosis under the scheme conducted by the Department of Agriculture. Under this scheme a tuberculosis-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests, or upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

ACCREDITED TUBERCLE FREE HERDS.

Name.	Address.	Number in Herd.	Name.	Address.	Number in Herd.
Ballarat Mental Hosp...	Ballarat	78	Onley, W. H. ..	"Glenholme," Caldermeade	64
Banyule Stud Pty. Ltd.	Heidelberg	38			
Dennis, Mrs. A. A. ..	Frankston	33	Payne, A. E. T. ..	"Yarra View," Lilydale	77
Dookie Agricultural College	Dookie	78	Payne, T. E. N. ..	"Woodburn," Kilmore	58
Dunbar and Clark, Messrs.	"Hazeldean Dairy," Mount Dandenong	15	Powell, T. S. ..	"Carellen," Mansfield	45
Geelong Grammar School	Corio	58	Richardson Bros., Messrs.	"Faldinghurst," Upper Beaconsfield ..	30
Gorman, A. W. ..	"Cathcart," Alexandra	61	Samuel, B. T. ..	Lang Lang ..	60
Henderson, J. L. and E. I.	Wangaratta ..	95	School of Horticulture..	Burnley	8
Holloway, R. W. ..	Caldermeade ..	56	State Experiment Farm	Rutherglen ..	51
Lawrence, F. H. ..	"Rainga," Tarrawarra	60	State Research Farm ..	Werribee	211
Longerenong Agricultural College	Dooen	47	Wells, W. G. ..	Caldermeade ..	62

In addition to the above-mentioned herds there are 129 commercial dairy herds containing 4,571 head of cattle which may be considered free of tuberculosis. All these herds have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds, they cannot be considered as accredited under the accreditation scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

There are also 91 herds in which 4,442 head of cattle have passed one test, and may be considered, therefore to be in process of becoming tuberculosis-free herds.

The Laying Flock

In poultry farming there are certain factors having a direct bearing on the egg-output of the laying flock. In the first place, the parent stock must be strong and vigorous. The hens also must possess the ability to lay a large number of eggs of the right size, shape, and texture of shell. The laying flock must be kept in clean, dry, and comfortable quarters, and the floors, preferably concrete, should be covered with straw 4 to 6 inches deep. Parasites must be kept in check by the application of a good disinfectant.

It is necessary also to feed the birds on a variety of good wholesome food. One of the many rations suitable for fowls for egg production is as follows:—

Bran 30 lb., wheat pollard 50 lb., barley meal, oat pollard, or maize meal 10 lb., meat meal or dried butter-milk 10 lb.

This mixture may be fed as a dry or wet mash. If fed as a wet mash, approximately 20 per cent. of chaffed green food is added. If fed as a dry mash, it is kept before the birds continuously, and the green food is fed separately. One-half to 1 per cent. of common salt may be added to either the wet or dry mash. The grain ration fed to the birds in the afternoon may consist of wheat 60 lb., oats or barley 20 lb., maize 20 lb.

It is very necessary to realize that the eggs are produced from the food in excess of that required for the general upkeep of the birds; therefore, in order to obtain the maximum number of eggs, it is necessary to feed approximately 2 oz. of mash and 2 oz. of grain to each bird per day. Shell grit, charcoal, and a liberal supply of pure cool drinking water should be kept constantly before the birds.

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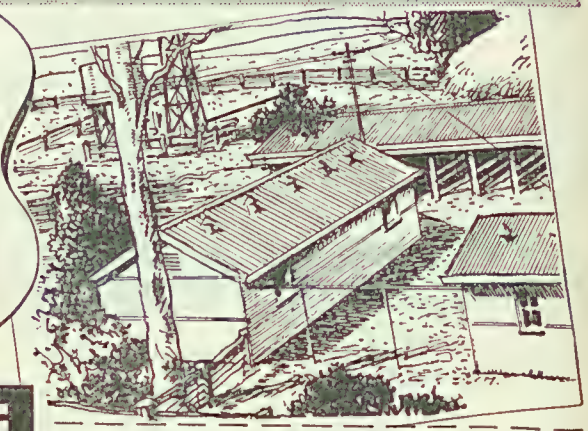

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The Journal of the DEPARTMENT of AGRICULTURE of VICTORIA

Journal of Agriculture, Victoria—December, 1941.

Results at Dookie College and Other Centres

By H. C. FORSTER, Ph.D., M.Agr.Sc., Senior Cereal Research Officer; A. B. HACKWELL, B.Agr.Sc., Agricultural Instructor; H. C. H. WATSON, Field Officer.

DOOKIE AGRICULTURAL COLLEGE is situated in the eastern sector of the main Victorian wheat belt and also is in the centre of a very extensive sheep raising area. The average annual rainfall is 21 inches.

Wheat improvement work has been undertaken at the College for more than 50 years. The breeding and development of wheat varieties was commenced in the eighties by Mr. Hugh Pye, who continued this work until his retirement in 1933. Throughout his long career as a wheat breeder Mr. Pye produced many valuable varieties and achieved notable success with such wheats as Warden, Currawa, Major, Gluclub, Baldmin, and others.

Since 1933 the Department of Agriculture, at the request of the Council of Agricultural Education, has conducted the cereal research work at the College, and considerable extension has been made in recent years in the scope of the investigations.

The experiments are undertaken to furnish information on various factors associated with wheat growing, and the evidence from the tests has a wide application throughout the

Northern District, which is one of the principal wheat producing areas of the State. The soils throughout this district vary in texture and fertility—they are mostly red in colour and range from stiff clays to friable loams. There are also one or two relatively small pockets of very fertile "black" land. The rainfall varies from 15 to 25 inches per annum, the bulk of the wheat being grown in the 16 to 21 inch division.

In the experimental fields at Dookie College the soils are mostly red loams of moderately good fertility. The main trials are carried out under modern methods of field experimentation, and are located in three paddocks cropped under the rotation, fallow–wheat–oats and peas (cut for hay or silage). The area devoted each year to the cereal plots amounts to some 50 acres. New experiments on pasture improvement and the maintenance of soil fertility also are in progress, and the results from these sections should prove of general interest, as sheep raising, in conjunction with cereal growing, is so widely practised in the district.

In addition to the work at Dookie College, cereal experiments are conducted by the Department of Agriculture at other centres in the Northern Districts, namely, at the Rutherglen Experiment Farm and on a smaller scale at Invergordon. In past years, tests were carried out at Shepparton and Waaia also, and this season new trials were commenced at Diggora in the Rochester–Elmore area, to the west.

Seasonal Conditions at Dookie, 1941.

The season to date in the Dookie district has been favourable for the growth of cereals, especially for crops sown on fallow.

The rainfall in both January and March was particularly heavy, more than 6 inches being recorded in each month. These concentrated falls resulted in erosion damage in certain parts of the district, but no trouble was experienced on the experimental areas. Dry weather during April and May enabled early sowing to be undertaken, and a satisfactory germination was obtained. The winter rainfall was below average. Cereals, however, made good growth, but the pastures were backward. Normal rains were received in early spring and the prospects in mid-November were that heavy yields would be obtained, provided the season finished well without development of rust.

RAINFALL RECORDS—DOOKIE COLLEGE.

—	1938.	1939.	1940.	1941.	Average 60 years.
January ..	138	22	12	672	120
February ..	86	633	6	30	123
March ..	2	245	7	612	142
April ..	70	855	317	26	186
May ..	43	77	78	90	203
June ..	294	445	71	169	265
July ..	232	181	200	239	206
August ..	144	548	76	112	229
September ..	19	167	259	226	193
October ..	9	231	41	179	204
November ..	14	235	120	..	134
December ..	..	39	198	..	125
Total points	1,053	3,678	1,385	..	2,124

Cereal Breeding—Wheat Variety Tests.

The practice of the Department is to carry out the crossing and first generation stages of cereal breeding work at the State Research Farm, Werribee.

The second generation crossbreds are then sown in stud rows at the various experimental stations throughout the State, where selections

The Cerealist of the Department of Agriculture (Mr. G. S. Gordon) explaining the breeding of new wheat varieties at a Dookie Field Day.

of the more promising strains are made and seed supplies developed. Only those plants exhibiting desirable characters are considered for further testing and selection, and, after a number of years, only a few of the more promising true-breeding strains of the original population are retained.

New crossbreds which have shown promise in the stud rows are transferred to the *Junior Yield Trial* for their first accurate yield tests. The trial is replicated, and this year eight named varieties and 56 new crossbreds and selections were sown.

After an extended period in the junior plots the best varieties are then promoted to the larger *Senior Yield Trial* for further testing over a number of years. To increase the accuracy of the experiment, the trial is repeated at two sowings separated by a short interval.

The varieties under test are reviewed each season, and new wheats are included from time to time to replace those discarded on account of their lower yielding ability or other inferior characters. Special attention is paid to varieties possessing superior flour quality, and each year comprehensive milling and baking tests are carried out by the Departmental cereal chemists on all varieties in these sections.

In the Senior Yield Trial fourteen wheats are under replicated test this season, namely, Ghurka, Baldmin, Rance 4H, Magnet, Quadrat, Pindar, Regalia, Bencubbin, Dundee, and the crossbreds Deakin x Ghurka, Ghurka x Amity, Ghurka x White Fife (two selections), and Wannon x Ghurka. The plots were sown on 15th and 27th May with 65 lb. of seed and 150 lb. of superphosphate per acre.

The average yields obtained in past years in the departmental tests at Dookie College, together with the results at other centres in the Northern Districts are set out in Table I.

Prominent Wheats in the Northern District Tests.

Ghurka.—This variety has proved a very prolific grain yielder in most districts of the Victorian wheat belt, and has been the main variety sown in the State for the past six years. It is a free-stripping wheat with a short, strong straw, and has the additional advantages of being resistant to flag smut disease and partially resistant to rust. Under some circumstances its short straw is a disadvantage, for example, where the variety is required for hay or on areas where tall-growing weeds are troublesome.

Baldmin, which was bred at Dookie, has been an outstanding wheat in the College tests over many years, and also has yielded well at Invergordon and several other centres. The variety is of special interest as it produces grain of medium-strong flour quality. It is early maturing, white-chaffed, and grows fairly tall. Baldmin is inclined to exhibit a weakness in the straw, but this should not result in loss if harvested promptly.

TABLE I.—WHEAT VARIETY TRIALS IN THE NORTHERN DISTRICTS.

Average Yields in Bushels Per Acre.

Variety.	Dookie College.			Invergordon.			Rutherglen Experiment Farm.		Sheppar-ton.	Waala.
	5 years, 1936-40.	4 years, 1937-40.	3 years. 1938-40.	5 years, 1936-40.	4 years, 1937-40.	3 years, 1938-40.	4 years, 1937-40.	3 years, 1938-40.	4 years, 1930-33.	3 years, 1931-33.
Baldmin	38·4	37·6	31·7	25·5	20·8	16·6	22·1	19·0	..	..
Magnet	38·0	37·7	31·8	..	19·0	15·1	21·4	18·3	..	..
Quadrat	..	37·0	32·6	..	..	..	..	17·7	..	..
Pindar	..	..	31·0	..	..	18·1	..	18·3	..	..
Ghurka	33·5	33·4	30·0	24·7	21·6	19·4	19·5	17·2	24·9	21·2
Bencubbin ..	34·3	34·4	29·6	..	..	..	..	..	..	..
Dundee	34·2	33·7	28·7	23·3	19·4	16·3	21·8	18·1	..	..
Rance 4H ..	31·6	31·8	27·4	23·4	19·6	16·8	19·4	16·6	23·2	22·0
Regalia	..	..	..	..	..	16·1	..	17·2	..	..
Free Gallipoli ..	..	..	..	..	..	..	..	..	22·2	17·7
Major	..	..	..	..	..	..	..	..	18·8	17·5

NOTE.—The yields per acre quoted in this report are those actually harvested from the plots. Such yields are considerably higher (up to 20 per cent.) than would be the case if it were not necessary to have paths between the plots.

Ranee 4H has been one of the standard varieties grown in Victoria since 1930, and has proved a particularly good wheat in the lower rainfall areas. It has not yielded so well at Dookie as in other parts of the Northern District. The variety is early maturing and usually produces attractive grain somewhat larger than Ghurka.

Quadrat, formerly known as Ghurka x C.M.G. 5543, is one of the new wheats bred by the Department of Agriculture. It has been approved by the Victorian Wheat Advisory Committee for sowing in the Wimmera and East-Northern Districts. The variety has given particularly good results in all Wimmera tests since 1935, and has yielded consistently well at Dookie over the past four years. Its average yield at the College during that period (*vide* Table I.) was 3.6 bushels per acre greater than Ghurka, and at Rutherglen the average increase was 0.5 bushels per acre. Quadrat is a brown-chaffed free-stripping variety like Ghurka, and is slightly taller with a strong straw. It matures about the same time as Ghurka and is equally resistant to disease. The grain of Quadrat is normally of good colour, does not crack readily, and in flour quality is approximately equal to Ghurka.

Magnet, formerly Major x Free Gallipoli, is another new wheat recently produced by the Department of Agriculture. This variety, like Quadrat, has proved a prolific wheat in the Wimmera, and has given very encouraging results in tests in the Northern Districts. At Dookie, Magnet has been one of the leading varieties over the last five years, outyielding Ghurka by an average of 4.5 bushels per acre. In the Rutherglen tests it was superior to Ghurka by 1.9 bushels per acre (four years' average), but at Invergordon, where adverse seasons were experienced, the results to date are inconclusive. Magnet is a late-maturing white-chaffed variety with a strong straw of medium height. The grain is of average size, but does not thresh out as readily as Ghurka. In flour quality it is superior to Free Gallipoli and approximately equal to Ghurka. Magnet has been approved by the Wheat Advisory Committee for limited sowing in both the Wimmera and East-Northern Districts.

Dundee has yielded fairly well in the Northern District tests since being introduced from New South Wales in 1935. Like many other varieties it suffered badly in the rust epidemic of 1939. It is a brown-chaffed mid-season wheat and threshes freely. The grain is normally of average size, but often mottled. Dundee is classed as a medium-strong wheat, but its flour quality has been irregular. The variety is moderately resistant to flag smut and susceptible to rust.

Typical heads of the new wheat variety, Quadrat.

Other Varieties.—The early wheat **Bencubbin** has given moderately good grain yields at Dookie, and in view of its hay value may prove a useful dual purpose variety. **Pindar**, the new wheat distributed this year in the Mallee, is now under test in the Northern District, where its results to date are very promising. It is an improved selection of Ghurka (previously known as Selection W595 O5) and has good harvesting features similar to the parent variety. In flour quality Pindar is much superior to Ghurka and its grain is plump and very attractive. Pending further experimental evidence Pindar is not yet recommended for any district other than the Mallee. **Regalia** is a very early-maturing variety, which has done well in the Mallee and appears most suited to the lowest rainfall areas.

Wheats Grown in the Northern District.

The varieties sown in the Northern District have changed considerably in the last decade. Free Gallipoli, the most widely grown variety in 1930, reached its peak of popularity in 1933, occupying 57 per cent. of the wheat

Typical heads of Magnet wheat.

acreage of the district in that season. Since then the area sown to this variey has rapidly declined and it is now grown on 4 per cent. only of the total acreage. Major and Federation, which together accounted for nearly one-third of the area sown ten years ago, have practically gone out of cultivation.

Ghurka, on the other hand, has shown a pronounced increase. Sown on a relatively small area in 1933, it became the principal variety two years later, and has since been the chief wheat grown in the district, now occupying 45 per cent. of the acreage. Ranee 4H also has increased, and for several years has been sown on about 20 per cent. of the area. Another variety of interest is Dundee. Introduced in 1935 it rose to 23 per cent. of the area in 1938, but has since declined to 18 per cent. of the district acreage.

Varieties Recommended.

In view of the wide range of soil and climatic conditions in the statistical Northern District, the Wheat Advisory Committee considered it desirable, from the point of view of variety recommendations, to divide that district into two sections and group the eastern portion with the North-Eastern District. Two zones are thus formed, viz.:—Mid-Northern and East-Northern, with the Shepparton–Tocumwal railway as the approximate dividing line.

The wheats recommended for the East-Northern and Mid-Northern Zones by the Victorian Wheat Advisory Committee are as follow:—

Zone.	Main sowing.	Limited Sowing.
East-northern ..	Ghurka Baldmin	Quadrat Magnet Dundee Ranee 4H
Mid-northern* ..	Ghurka Ranee 4H	Dundee Baldmin

* The new wheats Quadrat and Magnet are excluded from the recommendations for this zone pending further experimental evidence.

Seed Wheat Production at Dookie.

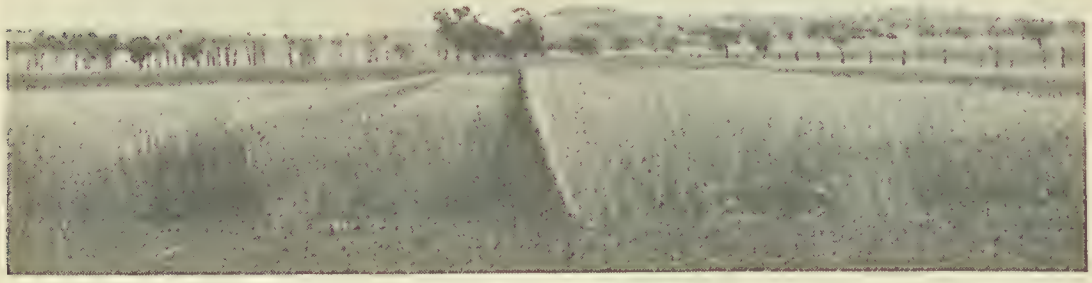
The seed production section is an important feature of the work on the cereal plots. Each year a number of wheat variety plots is sown with specially selected seed, which is kept pure and true to type. By this means a continuous supply of "fresh" seed of the most improved strain available is maintained. The produce from these plots is used to sow the College farm paddocks. In their turn these paddocks provide the seed wheat which is distributed in large quantities to farmers throughout the State.

Hay Trials.

Wheat and Oats Varieties.

Hay experiments with wheat and oats have been carried out on fallow and stubble land since 1934-5. In the tests on fallow, hay yields were obtained for six years and grain yields for four years (see Table II.).

Turvey and Warden were the most prolific of the hay varieties tested over the full period. Warden, on account of its red grain, is suitable as a hay wheat only and not as a dual-purpose variety. In addition, other hay wheats, including Yandilla King and Yanward, were tested from time to time and have now been replaced by newer varieties. Of these Bencubbin was the best dual-purpose wheat in 1940. The oat varieties, Algeribee and Dawn, both gave heavier yields of hay last year than the wheat varieties.



Oat variety plots at Dookie.

TABLE II.—HAY VARIETY TRIALS ON FALLOW WHEAT AND OATS.

Variety.	Hay yields in cwt./ac.		Grain Yields in bus./ac.	
	1940.	Average 6 years, 1935–40.	1940.	Average 4 years, 1935–37, 40
Wheat—				
Bencubbin	54·5	..	45·4	..
Dundee ..	53·6	..	41·0	..
Warden ..	51·5	46·0	41·6	36·2
Turvey ..	51·3	46·5	39·1	35·4
Baldmin ..	48·6	..	45·8	..
Wardfir ..	48·7	43·4	39·8	33·2
Magnet ..	36·8	..	45·2	..
Oats—				
Algeribee	64·5	..	56·2	..
Dawn ..	58·1	..	37·4	..

In the oaten hay trials on stubble land several new varieties have been introduced in recent years to compare their hay yields with the older types. The average results are summarized in Table III.

TABLE III.—HAY TRIALS WITH OAT VARIETIES—ON STUBBLE.

Yields in Cwt./ac.

—	Average 5 years, 1934–38.	Average 2 years, 1937–38.
Palestine x Dawn 5103 ..	..	21·0
Dawn	27·0	20·7
Algeribee	..	20·3
Algerian	26·4	19·0
Gidgee	25·3	19·4
Palestine x Belar	..	19·0
Belar	..	18·7
Mulga	24·5	18·6

Over the five year period *Dawn* returned the highest hay yield. This variety is a mid-season oat which matures a week or so earlier than Algerian. It has given very good hay yields in most districts and has proved a suitable variety for grazing purposes. Generally, Dawn gives a lower grain yield than Algerian.

Algeribee, which is another variety of special interest, was produced by the Department of Agriculture and distributed to farmers in 1939. It is an improved selection of Algerian and, like the parent variety, is a useful oat for general purposes—grain, hay, and grazing. It bears a general resemblance to Algerian, but comes away more rapidly in early spring. In many tests throughout the State, Algeribee has shown higher yielding ability for both hay and grain than Algerian.

The new crossbred Palestine x Dawn 5103, which is early-maturing, has given promising results in the two years' test at Dookie.

Oat Grazing Trials.

The practice of sowing oats to provide feed for sheep during the winter and spring months has increased in recent years. An experiment to furnish information as to the best varieties for this purpose was commenced at Dookie in 1938. The test was designed to measure the amount of grazing obtainable from various oat varieties grown on stubble land and their recovery capacity after grazing. Since the rate of seeding has an important effect on the amount of feed produced, this feature also was incorporated in the trials.

The experiment has been conducted in three sections, each receiving different grazing treatment, viz.:—

(*a*) Completely fed off—not harvested.
(*b*) Grazed once and subsequently cut for hay.
(*c*) Not grazed—cut for hay.

Three varieties, Algeribee, Dawn, and Mulga, were sown in each section at two rates of seeding, 60 lb. and 90 lb. per acre respectively, and a uniform application of superphosphate, ½ cwt. per acre, was used throughout the tests.

The oats in sections "*a*" and "*b*" were grazed each year in August, and section "*a*" was subsequently completely fed off with two additional grazings in September and November. The amount of green feed available for the sheep was measured by clipping representative samples of the forage just prior to each grazing.

The results of the experiment, showing the quantities of green fodder and hay yields from each variety, and the produce obtained with the different rates of seeding, are summarized in the following tables. The yields are the average for two seasons only—1938 and 1940. In the year 1939 the plots could not be sown owing to excessively wet conditions.

TABLE IV.—GRAZING TRIALS WITH OAT VARIETIES.—AMOUNT OF GREEN FEED PRODUCED AND RECOVERY CAPACITY AFTER GRAZING.

Average Yields—Two Years, 1938 and 1940.

—	Green Feed cwt./ac.	Hay Yield cwt./ac.
Completely fed off—		
Algeribee	38·2	..
Dawn	30·4	..
Mulga	27·2	..
Grazed once—		
Algeribee	11·2	10·8
Dawn	7·9	8·8
Mulga	7·9	7·6
Ungrazed—		
Algeribee	..	15·0
Dawn	..	15·7
Mulga	..	15·1

NOTE.—The yields are the average of both rates of seeding.

In reviewing the results it should be noted that in both years concerned, 1938 and 1940, the rainfall was well under average (as reflected in the low yields) and the data obtained to date applies more particularly to

Sheep grazing tests are a feature of the experimental work at Dookie.

seasons with dry conditions in late winter and spring rains below normal.

Regarding the total amount of green fodder produced in the "completely fed-off" section, the later-maturing variety, Algeribee, gave the heaviest bulk, 38.2 cwt./ac., and the early oat, Mulga, the lightest quantity, 27.2 cwt./ac.

In the section "grazed once," Algeribee again produced most green feed, 11.2 cwt., and recovered best to register the highest hay yield, 10.8 cwt. Dawn was next in recovery capacity, and in the plots that were not grazed, this oat gave a slightly higher hay yield than the other varieties.

An important feature of the experiment was that the oats receiving the one grazing in August did not recover well enough to return the quantity of hay produced on the ungrazed plots. The effect of this single grazing was to decrease the hay yield appreciably, the reduction being—Mulga 7.5 cwt./ac., Dawn 6.9 cwt./ac., and Algeribee 4.2 cwt./ac.

The results with the different rates of seeding were as set out in the table hereunder. The yields are the average for the three oat varieties (two years 1938 and 1940) :—

—	Oat Seed per Acre.	Green Feed.	Hay Yield.
	lb.	cwt./ac.	cwt./ac.
Completely fed off ..	90	34·6	..
	60	29·2	..
Grazed once	90	9·4	9·1
	60	8·6	9·0
Ungrazed	90	..	16·1
	60	..	14·5

In general, higher yields of both green fodder and hay were given with the heavier seeding rate, 90 lb./ac. This indicates that when oats are grown with the object of feeding-off, a fairly heavy amount of seed should be used, and, if the season is so favourable that grazing of the crop is unnecessary, no loss, and probably a gain, would result from the heavier sowing.

The oat-grazing experiment is being continued and definite conclusions should not be drawn until further evidence over an extended period of seasons is available. This year four varieties were sown, the new crossbred, Palestine x Dawn M 5126, being included.

Wheat Grazing Trials.

This experiment was commenced in 1936 to determine the effect on yield of grazing the wheat crop with sheep in late winter and to compare the behaviour of different varieties under grazed and ungrazed conditions.

In the first year of the test excessively wet conditions made it impracticable to feed off during the winter. The plots were eventually grazed in early September, although the crop by then had advanced far beyond the correct grazing stage. As would be expected, a marked reduction in yield, averaging 10 bus./ac., resulted.

Seasonal conditions in the next four years were suitable for the feeding off to be undertaken at the normal period, and the average results are shown in Table V.

TABLE V.—WHEAT GRAZING TRIALS.

Yields in bus./ac.

Average four years 1937-40.

—	Baldmin.	Ranee 4H.	Ghurka.
Ungrazed ..	32·0	28·6	30·7
Grazed	29·9	25·8	26·7
Decrease due to grazing ..	2·1	2·8	4·0

Seed 75 lb., super. 1 cwt./ac.

With each variety under test, the grain yield was reduced by grazing, the decrease, on the average, being greatest with Ghurka, namely, 4.0 bus./ac.

Wheat Manurial Trials.

In the nine years 1927 to 1935 the wheat manurial trials on fallow at Dookie were conducted on two permanent sites cropped under the two-course rotation, fallow—wheat. In 1936 the trials were converted into a replicated test (under the randomized block system) and transferred to the present experimental fields which are sown under the three-course rotation, fallow—wheat—oats and peas. The quantities of the various manures applied, together with the average yields, are set out in Table VI.

[*Continued on page 607.*

Export Market for Eggs

Drying Plants in Operation

IN the Legislative Assembly on November 19th, Mr. Hogan, Minister of Agriculture, said Victorian poultry farmers would have been ruined this year but for the action taken by the Commonwealth Government, the Department of Commerce, the Victorian Government, and the Egg Board, and his efforts, as Minister of Agriculture, on behalf of the industry.

Last June the British Government informed the Commonwealth and State Governments that it was unable to provide shipping space to take eggs in shell from Victoria or New South Wales this season.

The Commerce Department of the Commonwealth and the Egg Boards of New South Wales and Victoria secured drying plants to be erected at Footscray and Sydney to dry the eggs, and export the dried eggs in tins, which can be done without using refrigerated space.

Although its completion was delayed for three weeks by strikes, the Victorian plant was now working, eggs were being dried, and the pressure on our cool storage space was being relieved.

The Commonwealth Government was paying 1s. 1½d. a dozen for export quality eggs for drying. They were also paying for the purchase and erection of the drying plants, and meeting any loss sustained through deterioration in quality prior to the drying of the eggs.

An agreement had not yet been reached as to the price the British Government would pay for the egg powder, but the Commonwealth Government had committed itself to pay 1s. 1½d. per dozen to the Egg Board for export quality eggs and to meet the cost of drying the eggs.

£350,000 Bounty.

This action of the Commonwealth Government was equivalent to a bounty of £350,000 to the Australian poultry industry. In addition the Victorian Egg Board was paying producers more than ½d. a dozen over the Commonwealth Government's price for export eggs. On the 100,000 30-dozen cases already packed for drying in Victoria the Egg Board had already paid the egg producers in this State £7,650 more for their export eggs than had been received from the Commonwealth Government for the eggs.

This extra payment, Mr. Hogan added, was being paid out of the 1d. a dozen pool deduction. The Victorian Egg Board had also maintained the price of first quality hen eggs for local consumption at 1s. a dozen during the export packing season by removing from the market 52,000 cases (each of 30 dozen), which could not be sold in shell and, at a cost of £9,401, had converted the surplus to frozen whole egg for manufacturing purposes. Thus the total extra payment made by the Egg Board to producers in order to maintain local prices during the export season had been £17,000.

False Propaganda.

Critics of organized marketing, continued Mr. Hogan, had strenuously circulated false propaganda to the effect that the 1d. a dozen pool deduction was used to meet the administration costs of the Board. That assertion was absolutely false. Only an infinitesimal part of the penny pool deduction was being used for administration; the major portion went to provide an equalization fund to enable the Egg Board to pay to producers a higher price for export eggs, and eggs for pulp than the price it sold them for. This, added Mr. Hogan, was a wonderful achievement, and had been made possible only by organized marketing.

When the two egg-drying plants in Victoria and New South Wales were fully functioning they would be able to dry the whole of the export eggs in those States, and thus enable them to be exported without occupying refrigerated shipping space which is required by the British Government for what they regard as more essential foodstuffs.

If this provision had not been made all egg export would have ceased, the local market would have been glutted, prices would have collapsed, and poultry raisers would have been ruined. For the eggs they would have been able to sell on the local market, egg producers would have received only 3d. or 4d. per dozen.

Cheaper Wheat.

Mr. Hogan also pointed out that if poultry farmers bought wheat direct from the Australian Wheat Board they would be able to purchase wheat in truck loads for 4s. 3¾d. a bushel free on rails Williamstown. In districts where wheat stacks were available wheat could be bought in single-bag lots at the free on rails price Williamstown, less railway freight to Williamstown.

Pasture Plants of Victoria

5. The Foxtail Grasses (Genus Alopecurus)

By W. D. ANDREW, M.Agr.Sc., Assistant Agrostologist

This is the fifth of a series of articles presented in simple form to enable members of Young Farmers' Clubs and others to obtain an elementary knowledge of the pasture plants of Victoria. Previous articles appeared in this Journal as follow:—1. The Rye grasses (February). 2. The Canary grasses (June). 3. Weeping grass, Scented Vernal grass, and Veldt grasses (October). 4. Barley grasses (November). An explanation of the botanical terms used will be found at the conclusion of this article. For descriptive illustrations of botanical terms readers should refer to previous articles.

IN Victoria there are three species of foxtail grass. These are commonly known as Meadow, Marsh, and Slender foxtail respectively. Of the three, meadow foxtail alone is cultivated as a pasture grass and to a limited extent only. The foxtails are widespread in the better rainfall areas of Victoria, but are not commonly found in any great amount.

Meadow Foxtail (Alopecurus pratensis, L.).

Meadow foxtail is indigenous to the whole of Europe and the temperate regions of Asia, and was recorded as naturalized in Victoria in 1887.

Agricultural Features.

This species is a perennial grass which flourishes under wet, poorly-drained conditions unsuitable for grasses of a higher fodder value such as rye grass and cocksfoot. Conditions are not favorable for foxtail if the soil dries out badly during the summer, although this grass will persist on rising country under an annual rainfall of 26 inches. It will grow satisfactorily at high altitudes, and is to be found in a vigorous condition on the Dargo High Plains, in eastern Victoria.

Under favorable conditions, meadow foxtail makes vegetative growth throughout the greater part of the year, and it commences active spring growth earlier in the year than most of the other pasture grasses cultivated in Victoria. This latter quality is of value, as pasture is usually very scarce towards the end of the winter months. Opinions as to the fodder value of the herbage in comparison with other species vary somewhat, as stock do not seem to graze meadow foxtail as readily as some of the other grasses.

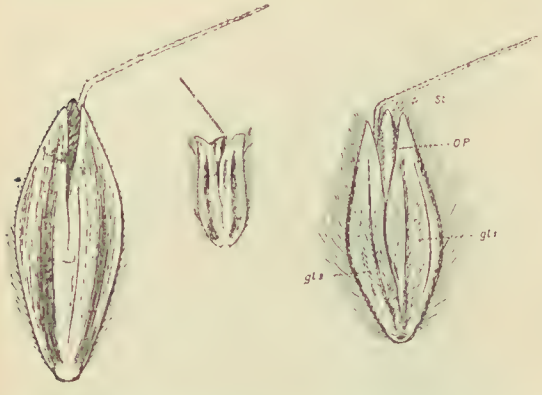
Meadow Foxtail (Alopecurus pratensis, L.). Note the closely veined leaves, perennial rootstock, and prominent awns on the spikelets. [After *Armstrong.*

The most vigorous pastures of meadow foxtail are to be found on moist fertile clay soils rich in organic matter, and under these conditions one usually finds fog grass as an associate.

Meadow foxtail may be sown in the autumn or the spring, and, for best results, white and strawberry clover should be sown at the same time

As the "seed" is of a light fluffy nature, it will not readily run through the drill, and the most satisfactory method of sowing is to mix it with the manure. In common with other grasses, deep sowing is inadvisable.

Meadow foxtail develops slowly in the first year, but after a few seasons the tussocks form a fairly close and persistent sward. A foxtail pasture including the clovers can have a good carrying capacity if regularly topdressed with superphosphate but perhaps



From left to right; spikelet of Slender, Marsh and Meadow Foxtail respectively. Note the difference in sizes, the shape of the outer glumes and manner in which they are united along their lower edges.

(After *Armstrong*.

not a small amount of the credit should be given to the leguminous species.

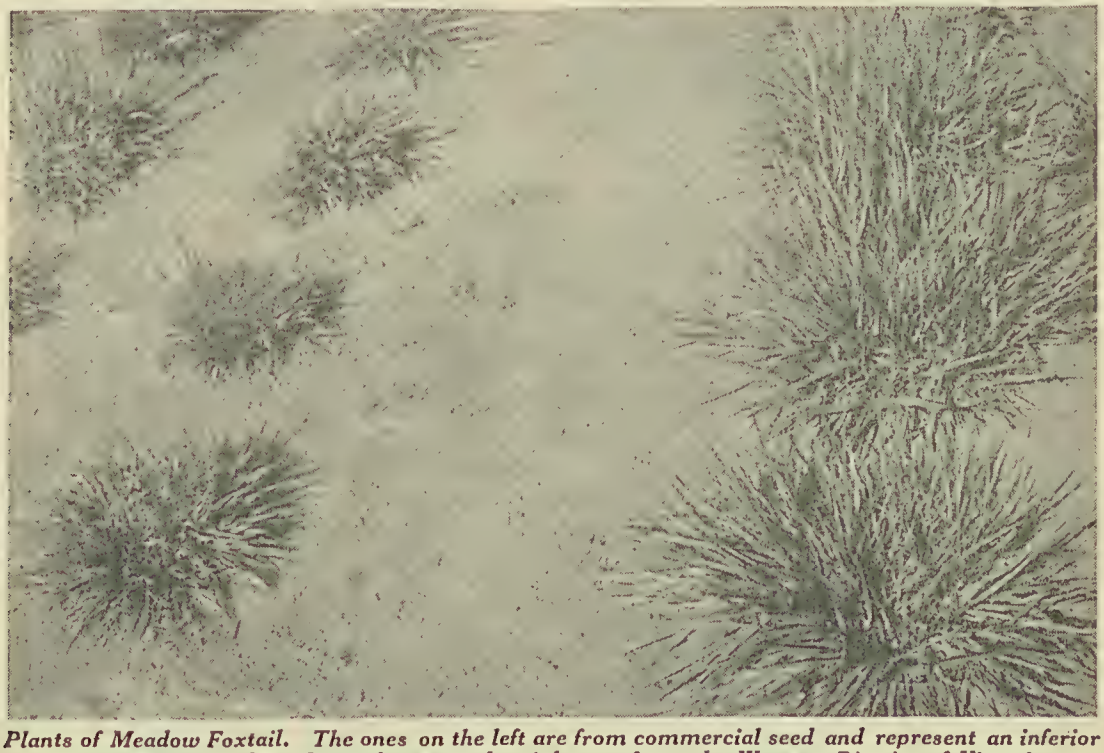
Meadow foxtail is suitable for making into hay, and a good aftermath growth usually follows mowing. This is due to the capacity of the grass for sustained growth and the fact that land on which this species grows abundantly usually holds the moisture well into the summer.

Identification.

The plants are hairless, generally very leafy, and succulent. They enlarge laterally by means of short stolons (over-ground creeping shoots) which enable the formation of a turf. The root system is shallow, and consists of a tangled mat of brown fibrous roots. Leaves are from 2 to 4 inches long, about $\frac{1}{4}$ inch wide, light-green in colour, closely veined with no prominent midrib, and are dull on both upper and lower surfaces. They are slightly rough to the touch if stroked toward the base. At the junction of the blade and the leaf sheath there are "collar-like" ledges, but no auricles are present. Young leaves are rolled in the shoot.

The leaf sheath is loosely wrapped around the stem, split in the upper part only, and usually distended where the flowering head emerges. Its colour changes from green to brown at the base of the plant.

The ligule usually is short, but varies in length and is blunt, entire (without toothing or division), and transparent. About the end of August the "spike-like" heads emerge, and these are borne on stalks (peduncles) about



Plants of Meadow Foxtail. The ones on the left are from commercial seed and represent an inferior type or strain. The robust plants on the right are from the Western District of Victoria.

1 to 3 feet high. Meadow foxtail is among the first grasses to flower in the spring, and the heads continue to appear until about January. Spikelets are single-flowered, and, as the two outer glumes are united along their lower edges, they will not readily tear apart. The outer glumes taper to a narrow point, bear scattered hairs, and have a fringe of long silky hairs on the midrib.

Florets usually consist of only one flowering glume (the lemma), which encases an ovary and stamens, but sometimes a second flowering glume (the palea) is present. The lemma is broad, has a blunt point, and bears a slender bent awn about twice its length which arises from near the base of the lemma. More than half the length of the awn protrudes from the top of the spikelet. The presence of these protruded awns gives the head a somewhat hairy appearance resembling a fox's tail; hence the vernacular name of the genus.

Meadow foxtail is protogynous, i.e., the stigma or receptive portion of the ovary matures before the pollen of the same flower. This means that seed can only be formed as a result of cross-fertilization. When mature the whole spikelet breaks away and the seeds of meadow foxtail are, therefore, really complete spikelets. This method of shedding is a characteristic feature of the foxtail group as distinct from some other groups in which the floret falls and leaves the outer glumes still attached to the pedicel. The grain (caryopsis) of meadow foxtail is flattened, oval in shape, and is yellowish in colour.

Three species of gall midge are known to parasitize the spikelets of meadow foxtail and prevent the formation of seed. These tiny insects deposit their eggs in the young florets, and the grubs which hatch out feed on the flower parts and leave only the empty glumes. Up to the present only one of these species has been recorded in this State.

"Seed" is not harvested commercially in Victoria, but there are areas in the Western District where a good strain of meadow foxtail occurs. "Seed" on the Victorian market has come mainly from England, United States, and New Zealand. A pound contains about 460,000 seeds.

Marsh Foxtail (Alopecurus geniculatus, L.).

Marsh foxtail, which is a native species, is a semi-aquatic or water-loving perennial, and is sometimes known as "Floating foxtail." It produces a sparse, stemmy growth, and its fodder value is not high.

A head of Meadow Foxtail on the left; two heads of Slender Foxtail on the right. The heads of this latter species are much narrower than those of Meadow Foxtail. [After *Armstrong.*

Identification.

A characteristic feature of marsh foxtail is its habit of forming elbows at the base of the stem and rooting from the lower knotty portions of the stems (the nodes). The stems usually are 12 inches to 18 inches in length and the leaves rather short and about 3-16th inch wide, with their midribs ill defined. In common with meadow foxtail, the leaves are closely veined.

The ligule is about $\frac{3}{8}$ inch in length, transparent, has a brownish tinge which is most pronounced at the base and tapers to a blunt point. Although plants are glabrous in appearance, the leaves are slightly rough on their upper surfaces and along their edges.

The "spike-like" heads are more slender and usually longer than those of meadow foxtail, but have a typical foxtail appearance. If a spikelet is examined closely, it will be noted

A plant of Marsh Foxtail. Note the elbowed stem, long ligule and typical foxtail veining of the leaves. (A) shows the manner in which the spikelets are borne on the rachis. (B) is a spikelet, (C) a floret and (D) the grain. [After *Breakwell.*

that the glumes have a blunt tip, whereas the glumes of the other two species have narrow, pointed tips. The outer glumes are united at their bases and have a fringe of hairs along their keels. The awning on the lemma is similar to that of meadow foxtail.

Slender Foxtail (Alopecurus agrestis, L.).

Slender foxtail is a native of the north temperate regions of Europe and Asia, and was recorded as naturalized in Victoria in 1887.

It occurs mainly as a weed grass of cultivated land in the better rainfall areas, but has not yet become a serious pest in this State.

An undesirable feature of this grass is that it usually flowers and sets seed before the crop is harvested, and so is not hampered by the removal of the crop. It can be kept in subjection by breaking up the land early in the year and working the ground in the autumn to kill the seedling growth before the crop is sown, or by substituting a spring-sown crop. Slender foxtail would not compete for very long with a vigorous pasture.

Identification.

As distinct from the two perennial species already described, slender foxtail is an annual or short-lived perennial. The plants, which are rather stemmy and open, grow to a height of from 18 inches to 2 feet. In common with the other foxtail species, it is glabrous, but the leaves are quite rough to the touch on both upper and lower surfaces and along their edges. The leaf veining is close and well defined, and on the lower surface there are five to seven veins more prominent than the rest.

One could not confuse the "spike-like" head with those of meadow or marsh foxtail, as it is longer and more slender, tapers at each end, and the spikelets do not closely overlap as in

Slender Foxtail. Note the sparse stemmy nature of the foliage and the long thin "spike-like" heads. [After *Armstrong.*

the other two species. Furthermore, the edges of the outer glumes of the spikelet are united from the base up to about the middle. The awn usually arises near the base of the flowering glume, is nearly twice its length, and is bent where it emerges from the tip of the spikelet. "Seeds" of slender foxtail are bigger than those of meadow foxtail, and the caryopsis is two to three times as large.

GLOSSARY OF BOTANICAL TERMS.

Anther.—That portion of a stamen which contains the pollen.
Auricles.—Lobes, most common at the junction of leaf and leaf sheath.
Awn.—A slender bristle, often the prolongation of a midrib.
Blade.—The expanded portion of the leaf.
Caryopsis.—The grain of a grass in which the seed coat is fused to the wall of the ovary.
Entire.—Without toothing or division.
Flowering glumes or pales.—The glumes which enclose the ovary and stamens. They are known as the lemma and palea respectively.
Floret.—The flower of a grass plant. When complete it consists of two flowering glumes or pales enclosing an ovary and stamens.
Glabrous.—Without hairs.
Hybrid plant.—A plant obtained by the fusion of the pollen of one species with the ovule of another
Inflorescence.—A general term for a group of flowers.
Leaf sheath.—Portion of the leaf which wraps around the stem.
Lemma.—The flowering glume which, with the palea, encloses the ovary and stamens.
Ligule.—The thin structure on the inside of a leaf at the junction of sheath and blade. It is sometimes reduced to a semi-circle of hairs.
Nodes.—The swollen, knotty portions along the length of the stem.
Outer glumes.—The glumes which shield the florets.
Ovary.—The female part of the floret. It contains the immature seed or ovule.
Pale.—This term is used for either of the flowering glumes (Palea or lemma).
Palea.—The flowering glume which is partly encased by the lemma.
Panicle.—A loose flower cluster.
Pedicel.—A flower stalk.
Peduncle.—The general term for the stalk of an inflorescence.
Protogynous.—A term used to indicate that the stigma matures before the pollen of the same flower.
Rachilla.—A secondary axis in the inflorescence of grasses.
Rachis.—The main axis of a spike or raceme.
Rhizome.—An underground creeping stem; "root-stock."
Seed.—After fertilization the ovule in the ovary develops into a seed (caryopsis). In most grasses this remains permanently encased by the flowering glumes or pales.
Spike.—An unbranched inflorescence in which the spikelets are sessile on the rachis.
Spikelet.—A group or a single floret shielded by one or more bracts or "outer glumes."
Stamen.—The part of the flower that bears the pollen. It consists of a pollen sack (anther) on a stalk (filament).
Sterile glume.—A glume which does not contain an ovary.
Sterile spikelet.—A spikelet which does not contain a fertile floret.
Stigma.—The receptive tip of the ovary. Grass florets usually have two stigmas.
Stolon.—A surface-creeping stem which generally roots at the nodes.
Tiller.—A sucker or branch from the bottom of the stem.

Christmas Mails

Christmas is fast approaching and once more the Post Office will be called upon to handle and distribute the huge Christmas-tide postings. The Deputy Director, Post and Telegraphs, accordingly, appeals to readers to post gifts and greetings as early as possible in December and not later than Tuesday the 16th. This year the Department is without the services of many experienced officers owing to war conditions and if postings are left until the last week before Christmas it will not be practicable for the postal staffs to effect delivery before the 25th December. The careful packing of gifts is most essential to ensure arrival in good condition and the name and address of the sender preceded by the word "From" should be clearly indicated on all packets. Packages may be marked, "Do not open until Christmas Day." It is essential to address postal articles clearly and fully at all times otherwise delay in delivery must result and in many cases delivery will not be practicable. At Christmas time the employment of a large number of temporary hands is necessary to treat the Christmas traffic, consequently full and correct addressing of postal articles is vital to their due disposal.

The Deputy Director's advice is to do your shopping immediately, pack all gifts securely, address fully and plainly and *post early* to avoid disappointment to your relatives and friends.

Codling Moth Control

The Value of Banding

By

V. L. LAWREY, Orchard Supervisor

BANDING is a very useful supplement to the usual spraying for the control of codling moth in apple and pear trees.

The object of banding is to attract and destroy large numbers of larvae after they have left the fruit, but before they emerge as moths to create another brood.

Some knowledge of the life history of the codling moth is necessary, however, if growers are to make efficient use of the bands.

After hibernation, the moths emerge during October and November and lay their eggs on the young fruit and leaves. Some of the larvae hatched from these eggs get through the protective spray covering and enter the fruit. The feeding period inside the fruit is somewhat variable, but in warm districts fully-grown larvae may leave the fruit from mid-November onwards to find a place to pupate. It is at this stage that the bands may become useful. Grubs instinctively descend to the butts of the trees, and under natural circumstances shelter under pieces of loose bark and rubbish around the butts and in the forks.

If the bands are in position and alternative cover, such as loose bark and rubbish, is removed, considerable numbers of grubs will seek shelter under the bands.

From the commencement of this stage there will be a constant movement of grubs from affected fruit to the bands, until all fruit has been removed from the tree. The destruction of these grubs reduces the number of moths to lay eggs for future broods.

Types of Bands

There are two main types of bands in general use. The most commonly used is one cut from old sacks in strips 2 or 3 inches wide, and long enough to go around the butts of the trees and slightly overlap. The ends are fastened to a nail driven into the tree trunk. The nail should be of the round-headed type, to allow the band to be taken off and replaced easily. Flat-headed case nails are unsatisfactory.

A chemically-treated band on a pear tree.

A single thickness of bag is sufficient, if the material is reasonably thick. A double thickness means that each time the band is inspected it has to be unravelled to ensure the destruction of all grubs. Comparatively few get between the two folds, and as these would almost certainly get under a single thickness, much time is wasted in unravelling a double band at each inspection.

The other type of band in use is a chemically-treated, corrugated, cardboard band, which destroys the grubs as they come in contact with it. After being put in position, this band does not require any further attention until the end of the season, when it should be destroyed.

Bag Bands Satisfactory

Of the two types, the bag bands are more satisfactory, despite the extra attention required. They attract at least three times as many grubs as the chemically-treated type, and, in addition, the forks of the trees can be examined at each inspection of the bands.

Bag bands should be inspected each ten to fourteen days during the season, according to weather conditions. All grubs found should be destroyed and the bands replaced.

After all the fruit has been harvested there is no further need to examine the bands until the next season is approaching, when all hibernating grubs should be destroyed. In this regard there is one point to be watched. At the time of the spring ploughing, overwintering grubs are disturbed in the rubbish around the tree and find their way to the bands. These bands may have been freed of grubs before the spring ploughing, and yet be found to be sheltering grubs shortly afterwards. These could not have come from fruit, and almost certainly have come from some alternative cover from which they have been disturbed. This would support the practice of leaving the bands on the trees the whole year round. However, an exception should be made to this practice where red spider is in existence in an orchard. Large quantities of the eggs of this pest are laid on the trunks of trees under the bands, where they are protected from the usual late winter spraying. In such cases the bands should be removed prior to spraying.

Once the grower adopts banding as a means of control, supplementary to spraying, he will realize its value from the quantities of larvae destroyed.

A bag band in position.

When to place Bands on Trees

To ensure best results, bands must be in position on the trees during the latter part of November, and examined regularly while the fruit is on the trees. The butts and forks of the trees must be kept clear of loose bark and rubbish, which offers alternative shelter. Rubbish should not be allowed to accumulate on the ground around the trees. After the first season the bands should be examined in September to ensure destruction of overwintering grubs.

Identification and Record-Keeping Systems for Pig Breeders

By L. A. DOWNEY, H.D.A., Pig Expert

TO be fully aware of facts regarding the performance of their stock, pig breeders should keep records in an accessible form.

Records of value to pig breeders, include the identification marks, of pigs, their pedigrees, ages, dates of service, and particulars about farrowings, weanings, and sales.

Positive identification of pigs is essential for any system of record keeping. There are several methods of marking pigs for identification. Some are suitable for identifying either live pigs or carcasses, while others are suitable for carcasses only.

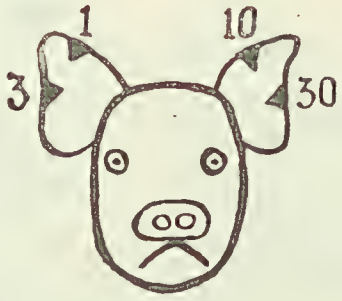


Fig. 1.—For this system of ear marking the positions are:— Right ear, inside edge No. 1; outside No. 3; left ear, inside edge No. 10; outside No. 30.

Ear Marking.

Ear marking is done with ear-marking pliers which cut a piece out of the edge or the inner part of the ear. Numerous designs of ear marks are available, but one design may be used on different parts of the ears of different pigs.

Several numbering systems of ear marking have been used by making marks on different parts of the ears to represent different numbers. When such a system is used, each portion of the ear must be well defined so as to avoid confusion in reading.

The ear-marking system illustrated in fig. 1 is one example of the many systems in which

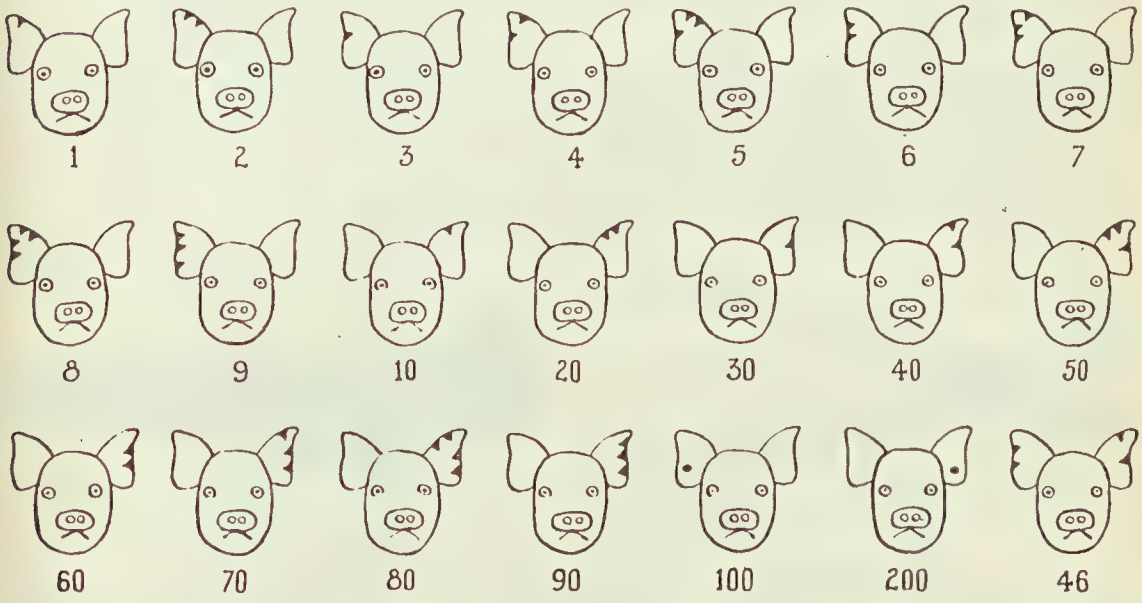


Fig. 2.—The notches used for numbers 1 to 9 are shown in the right ear and numbers 10 to 90 in the left ear. A punch hole through the right ear represents 100, and through the left ear 200. No. 46, selected at random is also shown.

notches on particular positions of the ears represent numbers, enabling each pig to carry a different number. In this system only two positions, the inside edge and the outside edge, are defined on each ear.

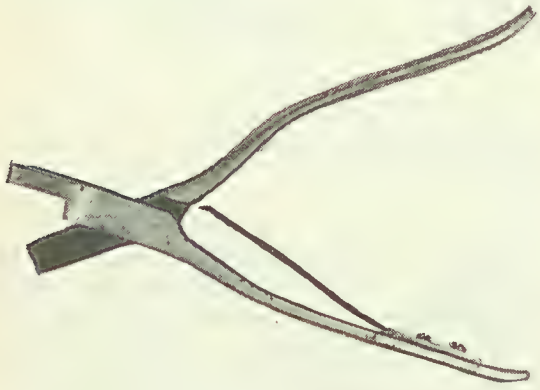


Fig. 3.— Ear-marking pliers.

An ear marker of simple design such as an inverted V is recommended for use in a numbering system.

Ear Tattooing.

Ear tattooing is used by breeders of registered white pigs. It is a more or less permanent mark, but generally pigs must be handled or examined at close range to read their tattoo. For this reason ear marking with pliers is sometimes adopted in conjunction with tattooing.

The ear tattoo instrument as shown in fig. 4 consists of pliers into which blocks may be fitted. The blocks contain needles in the design of letters, numerals, or characters. The ear is pierced by the tattoo needles and then a staining substance is applied to punctures made in the skin of the ear.

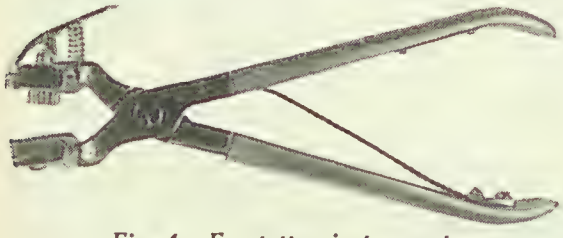


Fig. 4.—Ear tattoo instrument.

Ear Tagging

Ear tagging is sometimes adopted for the identification of pigs on the farm or when they are consigned for sale.

There are many designs of ear tags (see fig. 5), but none has proved to be really permanent. The tendency for pigs to bite one another's ears, and to rub their ears against fences and other objects, leads to many tags being torn from the ears. Some tags are also torn from the ears of pig carcasses when they are in the de-hairing machine.

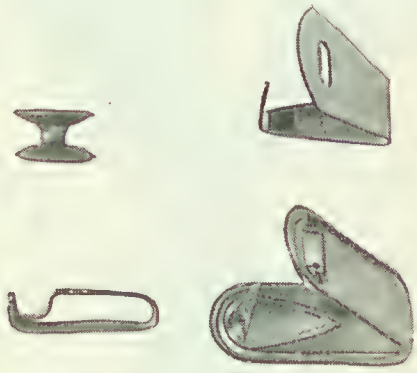


Fig. 5.—Four types of ear tags.

Temporary Brands.

Temporary brands such as fire brands, hair clip marks, and paint marks are used on pigs being consigned to sale yards or slaughtering establishments, but are of no value for permanent identification on the farm.

The Body Tattoo.

The body tattoo is a good method of marking pigs whose carcasses it is desired to identify after slaughter. The tattoo needle blocks are inserted into a slot with a handle attached (see fig. 6). The needle points are inserted in a staining substance and the pig is then struck on the shoulder so that the needles and stain pierce the skin. The resulting brand is not readily distinguishable on the live pig, but it is a very distinct mark on the carcass, and is an improvement on the fire brand, which disfigures the carcass and is not always distinct.

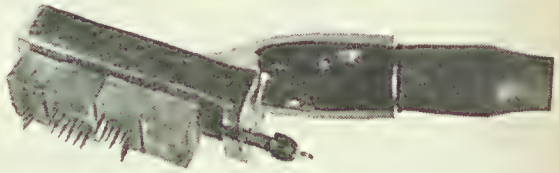


Fig. 6.—Instrument used for the body tattoo.

Recording Forms.

For most purposes the two forms of records referred to hereunder will supply the information required by pig breeders. These forms may be kept as cards or in books. Samples of

SERVICE RECORD

Sow's Name	Boar's Name	Date of Service	Date Due to Return	Date Due to Farrow

Fig. 7.—Boars' service record card.

these cards, as illustrated, are available free of charge on application to the Department of Agriculture, Melbourne.

Service Record.

The service record form is sufficient for a number of sows, and in most cases one form will do for the whole herd. On the service record is entered each service and the date (21 days later) that the sow should return to service if she has not conceived. A check on that date may give an early indication of infertility in the sows or boar which may otherwise go unnoticed for such a period as to cause considerable loss of food and labour.

The expected farrowing date, which can be calculated as 112 to 114 days after effective service, should be recorded, and with this date before him the breeder can make provision for proper care of the sow at farrowing time.

Sow's Production Record.

A production record form is required for each brood sow to cover all her litters. It should contain details concerning the farrowing, weaning, and disposal of each litter. Such information as is required to complete this form would allow the breeder to make a critical examination of each sow in his herd and would also throw light on the efficiency of the feeding and management of the pigs.

Before weaning the pigs of each litter should be ear marked so that the litter can be identified up to the time of its disposal.

In the case of pigs registered with the Australian Stud Pig Breeders' Society there are specific methods of applying registered identification marks with which breeders of registered pigs are familiar.

SOW'S PRODUCTION RECORD

*Name*_____ *Breeding*_____ *Sire*_____ *Dam*_____

*Born*_____ *Ear Mark*_____ *Number*_____

Farrowing				Weaning				Disposal of Litter				
Sire of Litter	Date	Male	Female	Date	Male	Female	Total Weight	Date	Number	Weight (Estimated Average Dressed)	Price	Total Price

Fig 8.—Sow's production record card.

Live Stock Notes

Reminders for December—January

Compiled by A. C. T. HEWITT, M.Agr.Sc., Live Stock Science Officer.

Dairy Cattle.

MANY necessary changes are taking place in dairy farming to meet the very serious shortage of labour. This has been met partly by the installation of milking machines and other labour-saving devices, and the assistance given by farmers' wives and their children; but, with the further shortage of hired labour and the loss of sons to the defence forces, many farmers have been forced to reduce their milking herds. The good prices obtainable for culled dairy cows on the beef markets are a further inducement to dairy farmers to reduce their herds to the number that can be milked and attended to with the labour available.

On some farms which apparently were overstocked, fewer cows are being milked without any appreciable drop in production, but generally, despite the very favourable season, production in many butter and cheese factories is down.

As beef, particularly canned beef, for which culled dairy cattle are suitable, is required in large quantities for the defence forces, it is expected that good prices for beef cattle will be maintained during the war and for some time afterwards during the period of re-stocking farms.

The raising of beef cattle in place of dairy cattle, and the rearing of dairy heifers for herd replacement to enable heavier culling of dairy cattle and to supply the increased demand when re-stocking takes place after the war, are avenues of supplementary income that every dairy farmer who has to reduce his dairy herd through necessity should consider. Even during the war, the demand for dairy heifers is expected to be keen, because the good prices for culled dairy cows will be an inducement for earlier and heavier culling.

Beef cattle require very little labour and the time taken to milk and attend to a dairy cow would be sufficient for attending to a small herd of dry or fattening cattle. However, the returns from beef cattle or fattening are very much less than from dairy cattle, and cattle fattening can be recommended only where it is not possible to milk the number of cows equal to the carrying capacity of the farm. On dairy farms and with present prices of beef, mutton, and lamb, cattle fattening should return more than sheep.

A reduced carrying capacity may be expected on many farms because improvements and maintenance have been reduced. These have been necessary on nearly all farms because of the shortage of labour, increased prices of materials, and the difficulty of securing them. Reduced topdressing has resulted in less pasturage, and less grass hay and silage, and has had the most serious effect on production and carrying capacity.

Sheep.

HAIR IN THE WOOL—VALUE OF FLEECE TESTING.

When it is realized that domestic, woolled sheep have apparently descended from the wild sheep of Western Asia, like the present day Black Head Persian and Karakul breeds, which have an outer hairy coat and an inner woolly coat, it is easy to account for the presence of hair in the wool of many domestic sheep.

By years of breeding and selection, this hairy coat has been reduced and the woolly coat greatly developed in the majority of the breeds of domestic sheep to-day. In the Merino breed the hairy coat has been practically bred out and the fleece is almost entirely wool. However, in the British breeds and breeds such as the Corriedale, varying percentages of hair and kemp appear in the wool. Both hair and kemp are undesirable, because of their inferior dyeing and elastic properties and greater diameter of the fibres, making them very undesirable in the manufacture of the finest textile materials.

At the Gordon Institute of Technology, Geelong, a well-equipped laboratory is maintained for the testing of wool and woollen products. To assist breeders in the accurate selection of rams and ewes carrying fleeces with a minimum amount of hair, the institute has a Fleece Testing Service open to all breeders. A nominal charge of 1s. per sheep is made, if six samples are taken, or 2s. 6d. per sheep if eighteen samples are taken, as is recommended with important stud sheep, plus a maximum travelling charge of 3d. per sheep, if travelling is necessary.

A Field Officer from the Institute does the sampling to ensure accurate results. This is done prior to shearing or at any other convenient time after six months from the last shearing. The size of the sample is a small staple. The samples are taken to the laboratory and measured for the percentage of hair (or gare) and kemp occurring in the fleece by using the Benzol Test in an instrument known as a Medullometer. A judgment of the likely breeding performance of that sheep, based on the samples taken from six (or eighteen) definite points of the fleece, is also made.

The breeder is given a full and detailed report on each sheep tested, and the results of all testing are strictly confidential, unless the breeder desires otherwise.

Apart from actually testing the fleeces of individual sheep, the breeding performance, as far as hairiness is concerned, may be obtained by testing the progeny of stud rams and ewes. The ram or ewe whose progeny carry good fleeces containing little or no hair, is superior to the ram or ewe which has no hair and yet whose progeny contains varying precentages of hair in the wool. Already some breeders are using this Fleece Testing Service for the progeny testing of their sheep, in addition to the fleece testing of their individual sheep for stud and sale purposes.

Tests on wool from 698 sheep were made at the Gordon Institute of Technology in 1940. Of 205 Merinos tested, three showed a significant quantity of hair, averaging 2.3 per cent. in the shoulder and 9.9. per cent. in the hindquarters, 39 showed traces of fine hair averaging about one hair per 500 wool fibres and the remainder (163) were practically free of hair. Almost all of the eighteen Polwarths tested showed a trace of fine hair, but in no case was more than 2 per cent. observed. The average hair percentages for 96 Corriedale rams were 2.53 per cent. on the hind-quarters, 2.21 per cent. on the sides, and 2.0 per cent. on the fore-quarters, and for 198 Corriedale ewes the respective percentages were 3.3, 2.73, and 1.9. The hind-quarter samples of wool from six Shropshires averaged 2.4 per cent. of hair The remaining sheep tested were crossbreds and the amount of hair present varied from traces in the finer wools—58's and 60's—to 4.5 per cent. in the strong wool with a 40's count.

Further information concerning the fleece testing of sheep may be obtained from the Principal of the Gordon Institute of Technology, Geelong, or the Superintendent of Live Stock, Department of Agriculture, Melbourne, C.2.

Top Prices for Pigs.

The small percentage of really prime pigs being marketed is still a serious matter, and pig raisers, whenever posible, should critically compare their pigs with those which make the highest prices per lb. at auction. It is not unusual to see pigs of similar weights make prices differing by 10s. per head at the one sale. The difference is due, to some extent, to the vagaries of auction selling, but it is mainly due to differences in the quality of the pigs.

Quality in pork and bacon pigs is defined by consumers, and their definition is translated by pig buyers in their buying operations.

The most common fault seen in porkers and baconers is over-fatness and under-condition. Irrespective of weight, prime pigs are those which are well-fleshed and carry just sufficient fat to give them a finished appearance. Buyers and auctioneers are usually willing and able to indicate the desirable appearance of pigs to the grower if he inquires.

Long-bodied pigs, provided they are in good condition, are preferable to short and thick pigs. Pigs whose skins are covered with wrinkles, mange, and scratches have less appeal to buyers than pigs with clean and smooth skins.

Pig raisers should get a competent opinion on the pigs they market, and compare their price per lb. with the top price. If the results are not satisfactory the cause should be sought in the breeding stock, the feeding, the housing, or the management. Most errors occur in determining when pigs are fit for slaughter.

[L. A. Downey, H.D.A., Pig Expert.]

Poultry.

As the very hot weather approaches, special care and attention must be given to poultry, in order to avoid undue loss from heat apoplexy, and to maintain high egg production.

The number of deaths on each farm during a heat wave varies considerably. Many factors which influence the extent of mortality are involved, and various means of reducing this loss to a minimum have been tried.

Generally, the most satisfactory results have been achieved by spraying the litter and the walls of the houses, and also the birds, with water at frequent intervals during the hottest part of the day. General good managment of the whole of the operations on a poultry farm, however, is the key to success.

It is important that there should be ample room in the laying houses, as overcrowding causes the birds to become over-heated. A house 20 feet square, 8 feet high in the front, and 6 feet high at the back, with a 6-in. opening along the back under the roof, will allow of good ventilation, and provide sufficient room per 100 birds. Plenty of nests inside the houses are essential, and careful consideration should be given to their ventilation, so that the birds will be able to keep as cool as possible during laying.

Feeding on correct lines is necessary at all periods of the year. A suitable combination of clean and wholesome foods, sufficient for the birds' requirements, is essential to prevent them from becoming lowered in vigour. It should be a rule never to allow the birds access to any unclean or decomposing foods, as these greatly interfere with their health. Naturally these should be specially guarded against during the summer months. There are many kinds of green food that may be fed, and it is important that the birds should be provided with a continuous daily supply.

A most important consideration is the provision of a constant, plentiful, and easily accessible supply of fresh, cool drinking water. Water vessels that may be reached by the birds under normal weather conditions are sometimes found to be difficult to reach when the birds become distressed during the very hot weather. Water vessels placed temporarily on the floors in the centre of the pens, and as near as possible to the birds, have been of great advantage in this respect.

It should be fully realized that good birds, kept under healthful conditions, in clean houses, with clean perches and floor litter, free from parasitic infestation and disease-producing organisms, together with good feeding and management, are the principal means of maintaining a high standard of health and natural resistance to varying weather conditions.

[H. F. Clinton, Poultry Expert.]

Bees.

Swarming should now be over, and the bees should be in a more settled and contented humour than during the past few weeks.

Numerous reports of absconding swarms and young queens failing to return to the hive after the mating flight have come to hand. The abnormal weather conditions, causing delay and interference with the natural increase, which creates an element of excitement and instability throughout the apiary, are mainly responsible for this.

All colonies should now be examined and young queens introduced to queenless hives. If queens are not available, a brood frame containing eggs and newly hatched larvae should be supplied to enable the bees to rear a queen and re-establish the normal condition of the hive.

Migratory beekeepers should have their bees situated in a convenient position to gather the nectar from the yellow box trees now in bloom and red gums which should bloom towards the middle of the month.

Strong colonies are necessary to take full advantage of a comparatively short and heavy flow.

Weak colonies should be united unless required at the home apiary to hold young queens ready for an emergency.

Unless ground flora is available also, a pollen shortage may be experienced in districts where yellow box is the only eucalypt in bloom. Yellow box blossom, which is usually prolific in the secretion of nectar, is noted for a scarcity of pollen. Pollen is necessary for the feeding of young bees in the larval stage and for the mature worker. It provides the protein necessary for growth and development of the young bees, for the gathering of nectar, and conversion of nectar into honey by the workers. Without pollen a disinclination to gather nectar will be noted amongst the workers, followed by a decrease in the number of bees in the colony,

slight at first, but soon becoming more apparent. If this stage is reached, no time should be lost in moving the bees to a locality where pollen-bearing flora is present, thus enabling the colony to resume normal conditions.

[J. W. Thomlinson, Apiary Inspector.]

VETERINARY NOTES.

Botulism in Cattle.

Botulism, a common disease of cattle, is most prevalent in the north and north-west of Victoria. It is caused by a toxin or poison developed by certain organisms or germs in decaying animal carcasses, damaged fodder, or decomposing manure, particularly fowl manure. The cattle become affected when they eat these materials.

Symptoms.

The disease produces a general paralysis, at first apparent by a stiffness in the front legs. The affected animal also becomes mopey, slobbers from the mouth, and often discharges a watery substance from the nose. It ceases to chew the cud, and the tongue shows signs of paralysis. At first, the tongue is very limp, and may easily be pulled out of the mouth with the hand. Later it may protrude from the mouth.

An affected animal loses condition, and the ribs become flattened instead of well sprung, with a sinking of the muscles between the ribs. The breathing becomes very shallow, with no movement of the chest wall. Because of paralysis of the tongue and throat muscles, the animal is soon unable to eat or drink, although it may attempt to do so. It lies down, and finally, is unable to rise.

The average case usually lingers from three to five days, but in more acute cases death takes place within a few hours. When several cattle are affected at the same time, some may die suddenly and others linger for several days. Symptoms may not appear for several days after the contaminated material has been eaten.

Care must be taken when administering a purgative drench to prevent it going into the lungs, as the affected animal will have difficulty in swallowing. The mortality from botulism is very high in affected cattle, and very few cases recover even when treated early.

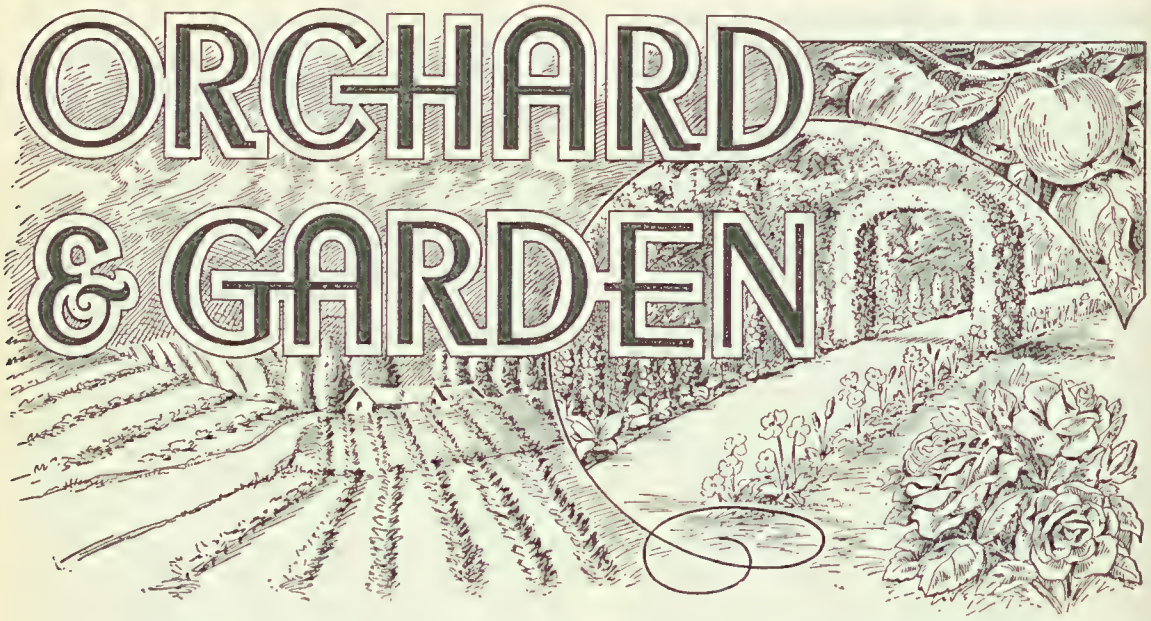
Prevention.

Botulism occurs most commonly in cattle suffering from a nutritional deficiency. Such cattle attack decaying carcasses with great relish, eat the decomposing hides and tendons, and chew the bones. Several cases of botulism frequently occur at the same time when a carcass which has lain intact for many months breaks up and becomes available to the cattle.

The disease can be controlled to a great extent by burying, burning, or isolating all carcasses and picking up all bones lying about the paddocks. Nutritional deficiencies should be corrected also, and, in this respect, bone flour or dicalcic phosphate should be given regularly to cattle either as a lick mixed with salt, or in the feed. As a lick, one part of bone flour or a half part of dicalcic phosphate should be mixed with two parts of salt.

On many farms, carcasses of cattle, horses, sheep, or rabbits are allowed to lie about, constituting a real source of danger to cattle from botulism. Not only should stock owners prevent their cattle gaining access to this material, but they should make every effort to remove and destroy it.

[H. M. Elder, B.V.Sc., Veterinary Officer.]



In the Orchard

By J. L. PROVAN, B.Agr.Sc.,
Senior Horticultural Instructor

Irrigation

A PRACTICE among some irrigators is to delay the application of water until the tree actually wilts. This wilted condition of the tree in the early part of the season checks both growth and fruit development of deciduous trees, and later in the season, when growth has practically ceased, it checks fruit development still further. If trees wilt during November, a marked "drop" of the setting fruit may occur, particularly with citrus fruits. This citrus "drop" is noticeable after a period of dry, hot weather, accompanied by north winds. In this case, although the soil may be well supplied with moisture, the transpiration from the foliage is so great that the roots cannot absorb moisture at a rate sufficient to meet the loss from the leaves. If the soil is dry, then the "drop" is more severe. The best results from irrigation practice are obtained when the water is applied before the tree shows signs of wilting. On the other hand, too frequent and too heavy applications of water result in the pore spaces of the soil being filled with water to the exclusion of air. The roots require air for their normal health and functions, and when deprived of it for too long a period, they become drowned. An excessive amount of water in the soil for even a short period may cause a check to the plant's growth.

Aphis and Pear Slug

Young pear, cherry, and plum trees should be inspected for aphis and pear and cherry slug. Aphis is seldom a serious problem on older pear trees, and the usual arsenate of lead sprays, applied for the control of codling moth, very effectively control the pear and cherry slug also. Young pear trees which are not yet in production, and therefore do not usually receive the arsenate of lead spray, may be seriously damaged by the pear and cherry slug. The slug is a voracious surface feeder on the leaves, and often skeletonizes them. It is easily controlled by a spray of arsenate of lead—1 lb. (paste) to 50 gallons of water. Until hot north winds are experienced, aphis will continue to be troublesome on fruit trees. Nicotine sulphate—1 pint in 80 gallons combined with 2 or 3 lb. of soft soap, to act as a wetter, is the best means of control. If the infestation is bad, this spray should be repeated as required.

Harvesting Valencia Late Oranges

Valencia Late Oranges should be harvested before they become too severely granulated. This variety when grown on rough lemon

root-stock on sandy, light soils, is very susceptible to granulation, and this condition makes the fruit less palatable. It is characterized by a loss of pulp colour, juice, and flavour, particularly around the stem end, and a thickening of the walls of the juice vesicles which gives the pulp a harsh or coarse texture. It is really a symptom of over-maturity, and fruit with a tendency to develop granulation should be picked early.

Fruit Packing Classes

It is anticipated that there will be a shortage of fruit packers this season, and arrangements are being made for fruit packing classes in various districts. These classes will be held during January and February, and an appeal is made to all those who are able and willing to assist the industry, by learning to pack fruit, to forward their names and addresses to the Department of Agriculture, Treasury Gardens, Melbourne, C.2.

In the Garden

By A. W. JESSEP, M.Agr.Sc., B.Sc., Dip. Ed., Principal, School of Horticulture, Burnley

MOST of the summer annuals should be transplanted out by now, but it is not too late to make further plantings of antirrhinum, cosmos, zinnia, celosia, portulaca, bonfire salvia, tithonia, and marigold.

Plant out dahlias this month and they should flower from February until the frosts cut them down. If planted earlier, the blooms are produced in midsummer, and dahlia flowers will not withstand the very hot sun. The same applies to the gladiolus.

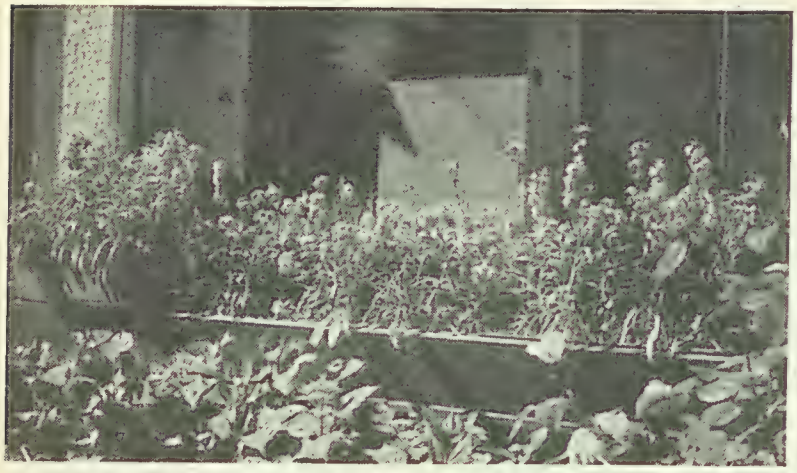
Although the weather is not very suitable for seed sowing, it is necessary to plant seeds of the Iceland poppy, pansy, viola, calendula, and primula malacoides in order to have them flowering throughout the winter months. The young seedlings should be protected during the hottest part of the day.

Window Boxes.

Where there is no area available for a garden, the flower lover will grow flowers in all types of containers, from tins a few inches in diameter to tubs of a foot or more. In some cases these plants are kept under cover, but the hardier types are grown in the open. From time to time, window-box gardening has been popular, and to-day the majority of flats and other such buildings with little or no garden space have their window boxes. These boxes may vary in size and design from the small primitive type to the large and sometimes over-decorative ones.

The type of window box used should conform with the general architecture of the building. When large boxes are installed, the soil question is often a serious one, as it has to be removed and replaced with fresh soil every year or so. To overcome this difficulty, and at the same time always have plants in bloom, duplicate boxes are used. These refills are easily handled, and several may be used to fill the window box. Usually two or three sets are required. One set is placed in position in the window frame, just as the flowers commence to bloom. Another set is planted so as to come into flower when the one in position commences to fade, and a third may be planted to replace the second one when necessary. By

Stages in the preparation of refills for a window-box.



Window-box freshly refilled. The last refill on left is about to be placed in box.

this means there are always plants in bloom in the window box. On the other hand, if seedlings are planted directly into the box, there is too long a period between the planting and the flowering period to give a reasonable display.

In other cases, the window box is filled with potted plants with moss or peaty soil packed around them. This is not very satisfactory, as the conditions are too severe for the choicer types of plants, although the aspidistra, aucuba, aralia, and such hardy plants will persist.

In all types of window boxes, the following facts must be kept in mind:—

1. Good drainage is essential. A hole should be made in the lowest portion, and provision made for the disposal of the drainage water. To prevent damage, a special drainage pipe should be installed according to requirements.

2. Place about 1 inch of ashes or crocks in the bottom of the box or the refills.

3. Use a medium light soil with leaf mould or some well-decayed stable manure worked through it.

4. Water carefully.

Blooms Throughout the Year.

For window boxes a wide range of plants may be used, but much depends upon the situation. Annuals give a colorful display, and, if refills are used, it is possible to have blooms throughout the whole year, as follow:—

Petunias in flower during December, January, February.

Pansies and Lobelias, during March, April, and May.

Primulas and Cinerarias, during September, October.

Stocks, during November.

In addition, cacti and succulents may be used in the summer, and bulbous plants, such as the daffodil, hyacinth, lachanalia, ranunculus, and anemones for the spring display.

Vegetable Growing.

Summer is the salad season, and successional sowings of lettuce, cucumber, radish, and tomatoes are advised. Further plantings of beetroot, carrots, French beans, peas, cabbages, and cauliflowers should be made. Keep the ground well hoed to prevent excessive loss of water. When watering do so thoroughly, and do not give just a sprinkle.

French Beans.

As French beans take about 60 days from the time of sowing until the pods are ready for picking, monthly plantings should be made from October until early March. French beans require a good open position, a reasonably friable and fertile soil, and plenty of water in the growing season, but the ground must be well drained, or stem rot probably will become serious.

Plant the seed 2 inches deep and 4 inches to 6 inches apart, with about 18 inches between the rows.

Varieties.

There are several varieties which produce good crisp pods, and the following are some of the good standard ones to grow:—

1. *Canadian Wonder* is very prolific and produces pods that carry well, and although only of medium quality is popular with growers.
2. *Feltham's Prolific* is a hardier variety than the *Canadian Wonder,* and for small gardens it is probably preferable. The pods are of good flavour, but it is not as prolific as the former.

   Pale Dun, Brown Beauty, and *Staley's Star* are also very satisfactory.

[Continued on page 604.

Pasture Improvement Competition

Coleraine District Awards

Report of the Judge, F. R. DRAKE, B.Agr.Sc., Assistant Agrostologist

IN a report on the Coleraine Pasture Improvement Competition conducted in 1940, and published in this *Journal* for December, 1940, comment was made on the difficulty experienced in comparing entries on high fertility country with entries on lighter land. This difficulty was largely overcome by allotting points for the degree of improvement effected over the natural pasture of the locality, in addition to the points for the quality of the pasture as such. The same system was adopted for the competition under review, and points were decided according to the following scale:—

	Maximum Points.
Botanical composition of pasture ..	35
Denseness	15
Management	25
Uniformity and general appearance ..	15
Freedom from weeds	10
Improvement	50
TOTAL ..	150

Probably owing to the more favourable climatic conditions prevailing, the number of entries showed an increase from five to ten. For the same reason the general quality of the entries showed a marked improvement, and several of the best entries were very excellent grazing pastures.

The district as a whole, by virtue of its good soils and favourable climate, is well suited to the growing of good pastures. The rainfall averages approximately 24 inches a year, and is reasonably reliable—from 1915 to 1939 inclusive, the yearly total was never below 20 inches nor above 30 inches. Even in 1940 the total for the year was only four points below 20 inches, although winter and spring conditions in that year were abnormally dry. This is a very satisfactory degree of uniformity compared with the fluctuations expected further north. Thus pasture improvement work may be proceeded with in the reasonable certainty that such improvement will not be undone by any period of really severe drought.

Soil conditions in that district vary considerably, and one may pass in quite a short distance, from good dairying country to country that, unimproved, is quite light carrying sheep country—some of it being rated at a little under one dry sheep to the acre. This lighter country, however, can be greatly improved by the introduction, usually after ploughing and cropping, of subterranean clover and perennial rye grass, coupled with phosphatic top-dressing.

In a dry season like 1940, improved areas on this lighter country showed to some advantage over the dairying country, the latter being severely drought stricken and in poor condition, with only sparse clover growths, rye grass little in evidence, and with a preponderance of annual grasses showing in ear. During the current season (one of abundant rainfall), many of these pastures, with careful management, have made very good recovery. On some, however, much of the rye grass seems to have gone out during the dry years, and, in such cases, capeweed and spear grass (*Bromus sterilis*) infestation is pronounced.

Entries representing a wide range of conditions were judged, and points were allotted as shown in the table on the following page.

RESULTS OF COMPETITION.

	Composition.	Denseness.	Management.	Uniformity and General Appearance.	Freedom from Weeds.	Improvement.	Total.
Possible Points ..	35	15	25	15	10	50	150
Mr. H. Lyon (No. 1 Entry)	33	14	24	14	9	35	129
Mr. L. A. Cornish (No. 2 Entry) ..	33	12	24	14	9	36	128
Mr. J. Lyon ..	33	14	23	14	9	34	127
Mr. H. Lyon (No. 2 Entry	33	14	24	13	8	34	126
Mr. M. Bunge ..	31	13	20	13	9	40	126
Mr. K. Davidson ..	30	13	22	12	8	34	119
Mr. O. Brown ..	32	12	20	12	8	35	119
Mr. L. A. Cornish (No. 1 Entry) ..	31	10	21	11	8	35	116
Mr. J. P. Clyne ..	29	13	20	10	7	30	109
Mr. R. D. Brown ..	28	12	19	9	7	32	107

As will be seen from the points allotted, it was difficult to separate the leading entries. The first three were all good mixed pastures, in splendid grazing conditions. The winning entry, that of Mr. H. Lyon, was placed third last year, while Mr. M. Bunge, who gained first place in that year, was placed equal fourth on this occasion. It may seem somewhat anomalous for the same entries, or rather fields, to change places like this, but, as stated above, seasonal conditions may re-act differently on the different classes of land. Also, points allotted must be based on the condition of the entries at the time of judging, and the appearance and vigour of a pasture at any given time may alter with varying conditions of management, grazing control, and climate. This year, some of the lighter country was excessively wet, resulting in growth being backward and the pastures lacking bloom.

The winning entry was a well-balanced pasture of perennial rye grass and subterranean clover, together with a little wallaby grass. The grasses and clover were well blended, to form an exceptionally dense, leafy sward providing very heavy grazing. Compared with its condition last year, this field was much denser and leafier, with less stemmy growth. The rye grass and clover had made splendid recovery, and the annual grasses seen last year were largely excluded by their growth. The entry placed second was another first-class rye grass-subterranean clover pasture, in excellent grazing condition, but compared with Mr. H. Lyon's field, not quite so dense and leafy, the difference probably being due to the greater age of the latter.

The remaining entries showed definite improvement over nearby unimproved country, some being in a more advanced stage of development than others. Several were presented in a condition either below or beyond the optimum grazing stage, and points were deducted accordingly. All of the fields inspected were on country capable of carrying good swards of clover and perennial rye grass, and in many entries the amount of rye grass was rather below what one would have liked to have seen. On this class of country, as improvement proceeds and fertility is built up by top-dressing and the growth of subterranean and other clovers, capeweed and other undesirable species are likely to volunteer strongly unless a vigorous rye grass sward is maintained.

In the Garden—*continued from page 602.*

The butter bean pods do not carry as well as the French beans, but are of excellent flavour and deserve to be grown more in the home garden. The pods should be picked when they begin to turn yellow. *Wax Pod* is the most popular variety, and the cultivation is the same as for the French beans.

Climbing Beans.

The climbing beans take about a month longer to mature than the French or butter beans, but they are very prolific, bear for a longer period, and the pods are larger than the dwarf types. As they require support, they are more troublesome to grow, unless there is a natural support such as a fence.

The *Epicure* is very popular, and produces large flat pods of excellent flavour, and it is very prolific. *Scarlet Runner* is grown a good deal, but is rather a shy yielder, particularly early in the season. Other good varieties include *Kentucky Wonder* and *General McKay.*

By RACHEL M. PEILE, Fruit Preserving Expert

CHOICE of fresh fruits during the autumn and winter months is limited, but, with the commencement of the main fruit season in the spring, the housewife's problem of providing varied fruit dishes for her family is greatly simplified.

Cherries usher in the new season, and are a welcome change from preserves and cool-store produce. Eaten raw, or cooked in various ways, they are delicious. Bottled, crystallized, or made into jam, they make a useful reserve when the fruit is out of season for use as a foundation for puddings and sweets. Cherry juices also may be preserved, and make a palatable and wholesome drink, especially for children.

Six different ways of using cherries and the approximate cost of each recipe are given below:—

Cherries (bottled).

Dark cherries give better results than light ones. Choose firm-ripe fruit, free from blemishes. Wash and stalk the cherries and pack them into a jar. Put 1 tablespoonful of water or cold syrup (4 oz. sugar to 1 pint water), which has been previously made, in the bottom of the jar. Place the lids loosely on each jar, then put the jars on a stand in the sterilizer and pour in cold water to just below the level of the stand. Sterilize the cherries for twenty minutes, or until they are cooked, keeping the water at boiling point. They may be tested by piercing with a darning needle. Overflow the jars with boiling syrup and seal down immediately, using sterilized rubber bands. When using vacuum jars, fill the jars with cold syrup after packing. Seal down and sterilize for half hour.

Approximate Cost.

	s.	d.
8 lb. cherries at 4d. per lb. ..	2	8
1 lb. sugar at 4d. per lb. ..	0	4
Firing	0	2
	3	2

Cherry Conserve.

Morello, Kentish, and Montmorency are the most suitable varieties to use. Stone the cherries, weigh them, and allow an equal weight of sugar. Put into a bowl and sprinkle with a small portion of the sugar. Next day simmer the fruit until cooked, adding 2 tablespoonsful of lemon juice to each pound of fruit. Add the remainder of the sugar and boil till of good consistency.

Approximate Cost.

	s.	d.
8 lb. cherries at 4d. per lb.	2	8
Sugar	1	4
3 lemons	0	3
Firing	0	1
	4	4

Cherry Mousse.

1 lb. cherries.
1 cup water.
2 tablespoonsful sugar.
1 teaspoonful lemon juice.
½ oz. gelatine.
1 egg white.
1 small bottle or tin of cream.

Cook the cherries with a little sugar and drain them. Stone and press through a sieve. Put the puree in a saucepan with the water, syrup, sugar, and lemon juice. Add gelatine which previously had been put in a little water to soak for fifteen minutes. Heat until the puree thickens, stirring all the time. Add the stiffly-beaten egg white and heat a little longer. Take from the heat, stir in part of the cream, and put the mousse in a mould. When set, turn out and decorate with the rest of the cream. If bottled cherries are used instead of fresh fruit, use only one tablespoonful of sugar instead of two.

Approximate Cost.

1 lb. of cherries at 4d. lb. ..	4d.
2 tablespoonsful sugar	½d.
½ oz. gelatine	1d.
Cream	6d.
	11½d.

Cherry Pie.

1 cup sugar.
¼ cup plain flour.
4 cups fresh pitted cherries.
1 tablespoonful butter.
Shortcrust.

Sift together sugar and flour and mix with cherries. Put the mixture into a pie-dish lined with good shortcrust. Dot the mixture with butter. Cover with shortcrust and bake in a moderately hot oven.

Approximate Cost.

1 cup sugar	2d.
¼ lb. flour	½d.
4 cups cherries	6d.
1 tablespoonful butter	1½d.
Shortcrust	8d.
Total	1s. 6d.

Cherry Sherbert.

Use any kind of cherry available. Black cherries make the best-looking drink. Cooking cherries require twice the amount of sugar, and white cherries require colouring essence. Stone 3 lb. of cherries, saving all the juice. Smash twelve stones and put with the cherries into a large earthenware crock. Add the finely-grated rind and juice of two lemons, 1 teaspoonful cream of tartar, six cloves, three black peppercorns, a few grains of nutmeg, and 2 lb. loaf sugar. Stir well, then pour over all 3 quarts of fast-boiling water. Cover with a thick cloth and leave to infuse all night. Next day, bring very slowly to boil, allow to simmer fifteen minutes, then cool to blood heat. Stir in 3 tablespoonsful rose water, and when quite cold strain through a flannel and then bottle. Keep in a cool place until required, and do not use under one week. To serve, put a pinch of bi-carbonate soda in bottom of glass if a fizzy drink is preferred.

Approximate Cost.

	s.	d.
3 lb. cherries	1	6
1 teaspoonful cream tartar 6 cloves .. .. 3 black peppercorns ..	0	1
2 lemons	0	2
2 lb. loaf sugar	1	0
3 tablespoonsful rose-water ..	0	2
	2	5

When bottled cherries have been used, and there is a quantity of juice over, it can be utilized in several ways:—

For soaking sponge cakes before making into trifles.
It may be served as a cool drink by adding lemon juice with sugar to sweeten, then diluting with water or soda water, and adding small pieces of ice.
It may be added to ice-cream mixtures for flavouring.

Cereal Tests in the Northern District—*continued from page 584.*

TABLE VI.—WHEAT MANURIAL TRIALS—DOOKIE.

Wheat Yields in bus./ac.

Manurial Treatment per Acre.	Average 9 years, 1927–35.	Average 5 years, 1936–40.
No manure	18·0	24·3
Super. ½ cwt.	22·0	30·3
Super. 1 cwt.	23·5	31·3
Super. 1½ cwt.	24·6	33·1
Super. 2 cwt.	23·7	33·3
Super. 1 cwt. + lime 10 cwt. ..	27·3	..
Super. 1 cwt. + lime 20 cwt.	..	33·4
*Super 1 cwt. + gypsum 10 cwt.	26·6	..
*Super. 1 cwt. + potash ½ cwt.	23·9	..
*Super. 1 cwt. + potash ½ cwt. + nitrate of soda ½ cwt. ..	23·3	..
*Super. 1 cwt. + farmyard manure 10 cwt.	22·6	..

* These four treatments were excluded from the replicated tests as conducted from 1936. In 1939 two additional treatments were included, basic phosphate 132 lb./ac. and super. 1 cwt. + gypsum 20 cwt./ac.

In these experiments plots treated with superphosphate have given substantial increases in yield over the no-manure plots. On the other hand no yield response was obtained with potash, nitrate of soda, or farmyard manure. Applications of lime and gypsum, applied one month prior to seeding, gave increased yields but the extra returns were not sufficiently high to suggest that these materials could be economically used on the wheat soils in this district.

A guide as to the quantity of superphosphate to apply in general practice is given in Table VII., in which the results of the replicated tests are analysed in detail. The table shows the extra yields obtained with the various dressings and the net monetary return from each application, with wheat valued at 3s. per bushel and superphosphate at £5 13s. per ton on the farm. It will be noted that, at the prices stated, 1½ cwt. per acre of superphosphate has been the most profitable dressing on the Dookie experimental sites.

TABLE VII.—EXTRA RETURN PER ACRE DUE TO SUPERPHOSPHATE—DOOKIE.

—	Average Yield 5 years, 1936–40.	Increase due to Super.	Value of Increase at 3s. per Bushel.	Cost of Super. at £5 13s. per Ton.	Extra Return per Acre due to the Super.
	bus./ac.	bus./ac.	s. d.	s. d.	s. d.
No manure ..	24·3	..	..	..	..
Super., ½ cwt.	30·3	6·0	18 0	2 10	15 2
Super., 1 cwt.	31·3	7·0	21 0	5 8	15 4
Super., 1½ cwt.	33·1	8·8	26 5	8 6	17 11
Super., 2 cwt.	33·3	9·0	27 0	11 4	15 8

Wheat manurial trials on fallow have been conducted at several other centres in the Northern Districts on various soil types and the average yields are listed in Table VIII. Material increases from superphosphate were recorded in all cases, and the results, which confirm those at Dookie, demonstrate that the liberal use of this fertilizer is essential for efficient wheat production.

TABLE VIII.—WHEAT MANURIAL TRIALS AT VARIOUS OTHER CENTRES IN THE NORTHERN DISTRICTS.

Yields in bus./ac.

—	No Manure.	Super., ½ cwt.	Super., 1 cwt.	Super., 1½ cwt.	Super., 2 cwt.
INVERGORDON (av. 7 yrs. 1934–40).					
Yield	20·3	25·9	27·3	28·5	28·9
Increase ..	..	5·6	7·0	8·2	8·6
WAAIA (av. 8 yrs. 1926–33).					
Yield	12·1	15·0	16·6	17·5	18·0
Increase ..	..	2·9	4·5	5·4	5·9
SHEPPARTON (av. 6 yrs. 1928–33).					
Yield	11·7	14·3	15·2	15·3	17·2
Increase ..	..	2·6	3·5	3·6	5·5
RUTHERGLEN (av. 22 yrs.).					
Yield	11·0	20·9	22·0	..	23·3
Increase ..	..	9·9	11·0	..	13·3

An examination of the returns in all the tests indicates that 1 cwt. per acre of superphosphate could be regarded as the standard dressing for wheat grown on fallowed land in the Northern areas and in some instances the application could, with profit, be increased to 1½ cwt. per acre.

Oat Manurial Trials.

ON STUBBLE.

In some of the higher rainfall districts, particularly south of the Divide, mixtures of superphosphate and sulphate of ammonia have produced substantial increases in stubble-sown cereal crops. An experiment to determine

the effect of these manures on stubble-sown oats in the Dookie district was commenced at the College in 1934.

The average results over five years (*vide* Table IX.) indicate that the small increase in hay yield obtained from the nitrogenous manure has not been sufficient to warrant a recommendation for its general use on stubble-sown oats in this district, under present-day prices.

A section of the wheat experimental plots at Dookie.

TABLE IX.—OAT MANURIAL TRIALS—ON STUBBLE.

Manure Applied per Acre.	Average Yield 5 Years 1934–38.
	cwt./ac.
No manure	23·7
Super. ½ cwt.	25·7
Super. and ammonia (1–1), ¾ cwt. ..	28·6
Super. and ammonia (1–1), 1 cwt. ..	28·9
Super. and ammonia (2–1), ¾ cwt. ..	28·2

Mineral Deficiency Trials.

WHEAT AND OATS.

In addition to the minerals such as phosphate, nitrate, potash, and calcium, which are recognized as being essential for plant growth, it has been established that certain "trace" or minor elements so called because they are required in minute quantities only, are also necessary for optimum plant development. Six of these "trace" elements or minerals (copper, zinc, iron, boron, magnesium, and manganese) are being tested on wheat and oats at Dookie. Each mineral was applied with a basal dressing of 1 cwt. of superphosphate per acre.

In two years' tests at this centre none of the minor elements produced any significant increase in the crop yields. There was evidence, however, that certain of these minerals had a detrimental effect on the crop and, until more definite information is available, care should be exercised in their use on farm areas.

In view of the interesting results with zinc sulphate on black soils in the Wimmera, this material is being tested on a similar type of black ground in the Dookie district. The plots are located on Mr. C. Bennett's farm. Up to date no response from the zinc has been obtained.

TABLE X.—MINERAL DEFICIENCY TRIALS.

Treatment per Acre.	Wheat Average 2 years, 1938, 40 bus./ac	Oats (Hay) 1940 cwt./ac.
Super. 1 cwt.	29·7	44·6
*Zinc sulphate 10 lb. ..	30·8	44·0
*Copper sulphate 10 lb. ..	27·2	43·6
*Iron sulphate 56 lb. ..	29·0	41·1
*Borax 5 lb.	29·5	44·9
*Magnesium sulphate 56 lb.	30·6	44·2
*Manganese sulphate 30 lb.	29·9	45·6
*Potassium sulphate 1 cwt.	31·0	42·1

* Each mineral was applied with 1 cwt. of super. per acre.

Rate and Time of Seeding Trials with Wheat.

In the rate and time of seeding trials, the wheat is sown at 50, 75, and 100 lb. of seed per acre. Three varieties, Ghurka, Baldmin, and Dundee, are used in the experiment, each being sown at the three seeding rates, at two times of sowing—normal and late. The normal-sown section is drilled in early May when practicable, and the late section approximately one month later.

The average results since the inception of the tests in 1938 are summarized in Table XI.

In regard to time of sowing, it will be noted that a substantial increase in the wheat yield was obtained in favour of the earlier sowing. This applied with each rate of seeding, the average increase in the plots being 5.8 bushels per acre.

TABLE XI.—RATE AND TIME OF SEEDING TRIALS—WHEAT.

Rate of Seed per Acre	Average Yield 3 Years, 1938–40. Bushels per Acre.		
	Normal Sown (May).	Late Sown (June).	Difference in Favour of May Sowing.
50 lb. ..	27·6	20·8	6·8
75 lb. ..	27·8	22·7	5·1
100 lb. ..	28·2	22·8	5·4
Average ..	27·9	22·1	5·8

The results to date confirm the general experience on the red loamy soils in the Dookie district, namely, that, provided the fallow is in good order and the land reasonably free from weeds, the sowing of the wheat crop in May returns higher average yields than later sowing.

In connexion with the rate of seeding, there was little difference in the yield from the three treatments 50, 75, and 100 lb. of seed per acre, in the section sown in May. This would indicate that, for general sowing at this period, heavy quantities of seed are not warranted—a suitable amount for normal, clean fallow would be from 60 to 70 lb. per acre for wheat sown for grain.

In the later-sown section, however, the heavier sowings gave relatively better results than the light seeding, suggesting that, as the time of sowing becomes later, the rate of seeding may be increased to a certain extent.

Winter fallowing at Dookie.

Cultivation Trials with Wheat.

A depth-of-sowing test with wheat has been conducted for the past three years. On the average, the yields from shallow and deep sowings have been approximately the same.

Trials with different cultivation treatments of the fallow at sowing time have been undertaken also. The tests were on fallow that was relatively free from weeds and up-to-date (three years' results) deep discing about a fortnight before seeding did not reduce the wheat yield, nor did a harrowing after sowing have any effect on the harvest returns. The experiments are being continued.

Disease Investigations.

WHEAT AND OATS.

The work at Dookie includes tests with various dry pickling powders used in the control of ball smut of wheat and smut diseases of oats, and also miscellaneous investigations on other cereal diseases.

Yield Trials have been conducted for several years to measure the effects of various pickles on the yield of wheat and oats. The powders tested were copper carbonate and two of the mercurial compounds which have come into prominence in recent years as cereal fungicides. The grain used in these trials was apparently clean seed and it was not artificially smutted. The cereals were dusted with the powders before sowing, and unpickled check plots were included. There was no significant difference in the yields from the pickled seed compared with the untreated grain, and it was evident, therefore, that the pickling powders did not stimulate increased yields with wheat and oats when normal clean seed was sown.

Effectiveness of Wheat Pickling Powders.—Various brands and types of commercial pickling powders have been tested to compare their efficacy in controlling *ball smut of wheat*. In this series of plots the grain (Dollar wheat) was artificially infected with spores of the disease and dusted with each powder. The results (as yet inconclusive) showed there were some differences in the effectiveness

An interested group of visitors at a Dookie Field Day.

of the powders tested, and the better brands of mercurial compounds gave the highest degree of control.

Wheat Pickling—General Comments.—Experience has shown that farmers should always carefully pickle their seed wheat, otherwise losses in yield from ball smut may be serious. The dry method of pickling is recommended in preference to the wet treatments—formalin and bluestone.

An important point in dry pickling is that the mixing of the grain and powder should be very thoroughly done, so that each seed receives its coating of pickle. With copper carbonate 1½ oz. per bushel of wheat is the dressing advocated, and this quantity, if uniformly mixed, should give quite satisfactory control with ordinary clean seed wheat.

The mercurial powders, which are more expensive, are also more efficient fungicides and, when thoroughly mixed, 1 oz. per bushel is sufficient to use for complete control of ball smut of wheat. These compounds are more poisonous than the copper powders. Their dust, however does not rise so freely, and for that reason grain treated with mercurial pickle is usually more pleasant to handle. The mercurial powders have a tendency to pack readily and require more constant agitation during the pickling process.

Loose Smut of Wheat, also known as blow smut, is much more difficult to control than ball smut. As the grain becomes infected internally (and not externally as with ball smut), ordinary pickling methods are ineffective. Hot water treatment of the seed is one method used, but it is not easily applied on large quantities of grain.

The development of resistant varieties and other experiments on the control of this disease are being carried out by the Department of Agriculture at various centres. The work at Dookie has been confined to different cultural treatments on the growing crop. The tests were of an exploratory nature and are being continued.

The only practical step the farmer can take to minimize loose smut of wheat is to sow seed harvested from a crop known to be comparatively free from the disease. When an appreciable amount of this smut appears in the crop a change of seed is desirable.

Oat Pickling Trials.—Experiments on the capacity of pickling powders in controlling head smut diseases of oats also have been carried out at Dookie. The tests were made with "infected" seed which was obtained from another district from oat crops exhibiting a heavy infection of smut in the previous year. Unpickled check plots were included

and the efficacy of the powders was measured by making counts of the number of smutted heads which developed during the season. The figures were as follow:—

Oat Pickling Tests.

No. of Smutted Heads.

	1937.	1938.
Unpickled	1,046	1,615
Copper Carbonate ..	674	1,306
Mercurial Compound C ..	39	1,061
Mercurial Compound A ..	6	589

It will be noted that each pickle gave some degree of control, best results being obtained with the mercurial compounds. In both years of the test, the smut infection was relatively low and in the unpickled plots was about 2 to 3 per cent.

In some seasons these oat diseases can be very severe and infections of up to 35 per cent. of the total plants have been recorded. Various experiments have proved that the oat smuts can be definitely checked by pickling. In view of the common occurrence of these diseases, particularly in the moister areas, it is sound practice for farmers to regularly pickle their seed oats. The use of the mercurial powders is the most effective treatment and the dressing advocated for oats is 1½ to 2 oz. per bushel.

Experiments at other centres have shown that the mercurial compounds are very efficient also in controlling covered smut of barley.

Susceptibility of Wheat Varieties to Rust.—The development of wheat varieties resistant to rust disease is one of the objectives of the Department's programme on wheat improvement. The first stage of this work involves an investigation into the susceptibility to rust of the present-day strains of wheat. The problem is being studied at Dookie, and observations and counts are made on the amount of infection shown by each variety. The wheats, 70 to 100 in number, are grown in the "bird-cage" under conditions designed to promote development of the disease.

Variety Trials with Barley, Peas, and Flax.

In the barley trials at Dookie, four new varieties are compared with the standard types, Cape and Prior, in yielding capacity and malting quality. The results since 1939 are shown herewith:—

Table XII.—Barley Variety Trial.

Yields in bus./ac.

Variety.	1940.	Average 2 years, 1939–40.
Feed Types—6 rowed—		
Cape	63·6	45·6
Sea of Azov x Roseworthy Oregon	61·0	45·6
Vaughn	53·4	37·6
Atlas	52·5	..
Malting Types—2 rowed—		
Prior x Plumage Archer ..	53·8	38·8
Prior	50·3	34·1

In the trials Cape barley and the crossbred, Sea of Azov x Roseworthy Oregon, have both returned higher grain yields than the two-rowed types, Prior and Prior x Plumage Archer.

The crossbred Sea of Azov x Roseworthy Oregon, which has yielded well for some years past at Werribee, has given encouraging results at Dookie. It matures earlier than Cape.

Of the two-rowed barleys under test, the crossbred Prior x Plumage Archer has given better yields than Prior in the two years' trial at Dookie. This new barley has shown superior yielding ability to Prior at several other centres in the State. The grain also is of better malting quality.

Vaughn and Atlas are two American varieties undergoing trial.

Peas.—Seven varieties of field peas are under replicated test for grain yield, viz.:—

Dun.
Lima.
Collegian.
Lemaire x White Brunswick.
Black Eyed Susan.
Tasmanian Blue.
Early Dun Selection.

The plots were sown on stubble land at 100 lb. of seed and ½ cwt. of superphosphate per acre.

In addition, a section on fallow is sown with single rows (44 varieties) for observation purposes, and there are seed multiplication rows of eight varieties.

Previous experience with peas at Dookie has shown that inoculation of the seed with nitrogen-fixing bacteria prior to seeding does

not materially increase growth and yield, thus indicating that the appropriate bacteria are present in the soils of the experimental areas.

Flax.—Seven varieties of flax were sown this year, primarily to study their possibilities for linseed production. Several recently imported types were included. The climatic conditions of the wheat areas of the Northern District are not considered suitable for the growing of flax for fibre.

Crop Rotation and Soil Fertility.

Rotation Trials.—A series of crop rotation tests was commenced at Dookie in 1940. The experiment is designed to furnish information on the yield of wheat crops grown under various systems of rotation with oats, bare fallow, pasture, &c., and to provide data on the important problem of maintaining soil fertility in comparable wheat growing areas.

The effects of the rotations will not become apparent for some years, and it is planned to conduct the trials over an extended period.

The rotations under test are as follows:—

1. Wheat—fallow.
2. Wheat—oats—fallow.
3. Wheat—oats grazed—fallow.
4. Wheat—oats grazed (ploughed spring).
5. Wheat—peas (grazed ripe)—wheat—fallow.
6. Wheat—oats + sub. clover—pasture—pasture (ploughed spring).

Establishment of Pastures on Cereal Stubble.—In all parts of the wheat belt pastures are of considerable importance, especially in the better rainfall sections where mixed farming is practised to a greater degree. In addition to the revenue provided from grazing, principally with sheep and lambs, land spelled in pasture is regenerated in soil fertility, which tends to deteriorate when intensive cropping is carried out over many years.

A common practice is to allow the paddocks that have been regularly cropped to revert to "grass" for varying periods. The carrying capacity of such volunteer growth is often of a moderate to low standard and, where conditions permit, much better results are obtained by introducing various pasture species either under a cover crop or by surface sowing. In many districts considerable success has been obtained with subterranean clover, Wimmera rye grass, and often with lucerne introduced in this manner.

Experiments on the establishment of these short-term pastures on land normally cropped with cereals were initiated at Dookie in 1939. Perennial and annual plants were sown on wheaten stubble, and although the trials that season were affected by severe flooding, a moderately good establishment of subterranean clover and Wimmera rye grass was obtained, and the former has now developed into a dense sward. Phalaris tuberosa and lucerne did not germinate well, but some plants are still in evidence.

A harvest scene at Dookie College.

In 1940 the site was not in good order, owing to seasonal difficulties, and poor establishment occurred. Weed competition and a severe attack of pea mites caused further damage.

This year the pasture species under test are:—Subterranean clover (Mt. Barker, Bacchus Marsh, and Dwalganup strains), burr and barrel medicks, bokhara and perennial red clovers, Wimmera rye grass, Phalaris tuberosa, and Bromus inermis. The trials were sown late in April in two sections, with and without a cover crop of oats (40 lb./ac.). Superphosphate at ½ cwt. per acre was used throughout.

The germination was generally satisfactory, but winter and early spring growth was slow. Where no cover crop was sown weeds made headway and adversely affected the less vigorous pasture species. In the cover crop section the plants made much better development.

Soil Fertility Trials—Clover-Lay Farming.—Recent investigations at the Rutherglen Experiment Farm (annual rainfall 23 inches) have demonstrated the possibilities in the wetter portions of the wheat belt of clover-lay farming, a system under which cereals may be successfully grown in rotation with clover pasture, without the necessity of fallowing. In the experiments, two successive wheat crops were sown (without fallow) on paddocks which had been under subterranean clover pasture for several years. The yields of both crops were as high as those obtained from normal fallowed land that had been regularly cropped with cereals. A similar result was given with oats and, after the cereals, a rapid re-establishment of the clover occurred.

The tests indicated that the inclusion of subterranean clover in rotation with cereal crops makes possible a system of farming in which the customary fallow may be omitted without loss of yield or reduction in soil fertility. Following the cereal crops the land is kept under clover for a further period.

Among the advantages of this method of farming are that stock-carrying capacity could be increased, the cereals produced at lower cost, and the replacement of the fallow by the clover pasture would assist in reducing the amount of soil erosion. For the system to be successful it is important that the clover be well established before the regular rotation is commenced and that the pasture be effectively manured and grazed.

A disadvantage of clover-lay farming, on the other hand, is that the whole of the soil cultivation is concentrated into a relatively short period in the autumn. The system, however, should be applicable to at least portion of the farm. Further, it is limited to those moderate rainfall districts where clover becomes readily established and cereal growing is undertaken.

The effect of subterranean clover in restoring soil fertility of well-cropped cereal paddocks, as illustrated at Rutherglen, is now being investigated at Dookie also. Experimental plots were initiated at the College this year to ascertain (*a*) the changes in fertility when land that has been under subterranean clover for many years is intensively cropped with cereals, and (*b*) the effect on the soil fertility of varying periods under the clover. The yield of wheat grown after the pasture will be compared with the yield in the standard rotation, fallow—wheat—oats.

Prosecution under the Fertilizers Act

The Mildura Co-operative Fruit Co. Ltd. was convicted by the Court of Petty Sessions at Mildura, on the 23rd September, 1941, for a violation of section 16 of the Fertilizers Act, and fined £1 10s. with £12 15s. 4d. costs.

The evidence disclosed that a sample, which was withdrawn from a parcel of twelve bags of Bryant's blood and bone, in the possession of the defendant company, was proved on analysis to be deficient in nitrogen to an extent exceeding the limit allowed by the Act, the percentage deficiency being 36.34, whereas a 5 per cent. deficiency only is allowed.

The value of the fertilizer per ton calculated from the label guarantee was £8 7s. 7d., and the value calculated from the analysis of the sample was £7 7s. 3d.

The Court was informed that there was not any suggestion of adulteration by the defendant company, and that they had sold the fertilizer as it was received.

Accredited Brucellosis-free Herds (Swine).

The following herds of pigs have been accredited as free of swine brucellosis (contagious abortion of pigs) by the Department of Agriculture.

An accredited brucellosis-free herd of pigs is one in which all animals therein have been subjected to two successive blood tests for brucellosis with negative results at intervals prescribed by the Chief Veterinary Inspector of the Department.

In order to remain accredited, a semi-annual or annual re-test (as determined by the Chief Veterinary Inspector) of all animals in the herd shall be conducted. If at a re-test any animal fails to give a negative reaction to the test, the herd shall not be declared brucellosis-free again until two tests of the complete herd have been carried out with negative results.

Full particulars of the Accredited Swine Brucellosis-free Herd Scheme and application forms may be obtained from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Name.	Address.	Name.	Address.
Bodey, A. A.	"Bonnyview," Dooen	Horn, L. A.	Leongatha North
Bowran, L. G.	"Glendare," Tallangatta	Longerenong College ..	Dooen
Bright, George H. ..	Dumbalk	Pietsch R. E.	Katyil
Castle, L. H.	Clarinda	Rintoul, J. T. C. ..	Glengarry
Critten, H. S.	Dumbalk	Roy, W. A.	Morrell's Hill, via Boolarra
Dookie Agricultural College	Dookie	State Experiment Farm	Rutherglen
Doornbusch, John L. ..	"Starpark", Nhill	Sutherland, R. N. ..	Nullawill
Fairchild and Clutterbuck	Tinamba	Trenery and Soderlund	"Promview", Foster
Geddes, L. D. ..	Bungaree	Trigg, A. J.	Bungaree
Harrison, C. T. ..	"Eastside" Stud, Pomborneit	Trigg, N. H.	Bullarook
Hawtin, I. E. & F. ..	"Rossmoyne", Colac.	Tweddle, J. T. ..	"Winlaton," Shepparton
Haywood, Dr. A. R. ..	Hastings	Walch, M. U.	Baring

Questions and Answers

The following questions have been received from correspondents and it is considered that the replies will be of general interest.

QUESTION.—I have a house cow from which I am forwarding a sample of milk for examination. Would you please let me know if the milk is free from disease, especially tuberculosis?

ANSWER.—The sample of milk will be examined by this Department for mastitis germs, and you will be notified of the result. Examination of milk samples for the presence or otherwise of tuberculosis is quite unsatisfactory as the germs may not be constantly and regularly present in the milk. The only reliable way to ascertain whether your cow is free from tuberculosis is by submitting the animal to the Tuberculin Test. This test can be carried out by any practising Veterinary Surgeon.

QUESTION.—Is it better to dehorn cattle as calves, or to wait until the horns are fully developed before removal?

ANSWER.—It is very much better to dehorn calves when they are one week old by means of an application of caustic potash, as this does not involve any pain, and completely stops the growth of the horns. If left until fully grown—about two years—a lot of damage may have been inflicted by the horns during that period.

QUESTION.—How much is crushed wheat and crushed maize worth when pollard is £6 5s. per 2,000 lb.?

ANSWER.—The relative monetary values of crushed or ground wheat and crushed or ground maize, compared with pollard at £6 5s. per 2,000 lb., are as follow:—

—	Per 2,000 lb.	Per bushel.	Per 2,240 lb.
	£ s. d.	£ s. d.	£ s. d.
Pollard ..	6 5 0	..	..
Wheat ..	6 10 6	0 3 11	7 6 0
Maize ..	6 19 6	0 3 11	7 18 0

Standard Herd Records

For Quarter ended 30th September, 1941

In the following is set out the records of all cows which completed a lactation during the quarter. The number is 524, of which 396 qualified for the certificate. The figure in brackets after the owner's name shows the number of entries.

The amount of butter-fat required for qualification varies with the age class to which the animal belongs, the standard being as follows:—

Junior 2-year-old (under 2½ years at time of calving)	230 lb. butter-fat.
Senior 2-year-old (between 2½ and 3 years at time of calving) ..	250 lb. butter-fat.
Junior 3-year-old (between 3 and 3½ years at time of calving) ..	270 lb. butter-fat.
Senior 3-year-old (between 3½ and 4 years at time of calving) ..	290 lb. butter-fat.
Junior 4-year-old (between 4 and 4½ years at time of calving ..	310 lb. butter-fat.
Senior 4-year-old (between 4½ and 5 years at time of calving) ..	330 lb. butter-fat.
Mature cow 5 years and over	350 lb. butter-fat.

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Alston, Mrs. N. B., and Sons, Romsey, Jersey (8).										
Rosyth Gay Bonnie ..	59331	273	15	6,840	5·24	358·7	350	Mature	209, 262, 310, 403	Werribee Gaypiece
Rosyth Gay Grevillea ..	55120	273	18	7,691	4·71	362·1	350	Mature	290, 321, 356, 404, 489	Werribee Gaypiece
Rosyth Grevillea ..	46068	273	15	7,121	4·82	343·5	350	Mature	250, 300, 302, 315, 303, 342, 352	Aveley Antony
Rosyth Noble Countess ..	59335	273	17	6,485	5·79	375·4	350	Mature	272, 217, 537	Werribee Gaypiece
Rosyth Princess Rosalie ..	50505	273	16	8,927	3·99	356·6	350	Mature	256, 337, 348, 346, 389, 427	Aveley Antony
Rosyth Rosebud ..	46073	273	18	7,125	4·80	341·9	350	Mature	246, 290, 399, 319, 344, 315, 351	Aveley Antony
Rosyth Starbright ..	69017	273	16	6,872	5·35	367·7	290	Sr. 3	297, 388	Rosyth Antony 3rd
Wompini King's Bell ..	64956	273	13	6,654	5·38	358·3	330	Sr. 4	261, 343, 383	Wompini Erl King
Anderson, I. R., Warburton, Jersey (3).										
Banyule Molly 55th ..	56254	273	18	8,741	5·02	438·7	330	Sr. 4	300, 419	Banyule Ettie's Oxford
Frayles Even Star ..	C.R.	255	4	4,696	5·63	264·4	230	Jr. 2	.. ..	Banyule Double Purple
Southdean Haughtiness ..	59462	273	14	6,926	5·40	374·0	310	Jr. 4	281, 355 ..	Banyule Ettie's Oxford
Andrew, W., Whittlesea, Ayrshire (7).										
Kelvin Grove Alert ..	32636	240	4	3,990	4·51	180·1	230	Jr. 2	.. ..	Kelvin Grove Lotus Lad 2nd
Kelvin Grove Bashful 2nd	32637	273	19	6,117	4·20	257·1	230	Jr. 2	.. ..	Kelvin Grove Lotus Lad 2nd
Kelvin Grove Love ..	32641	273	10½	4,697	4·47	210·1	230	Jr. 2	.. ..	Kelvin Grove Lotus Lad 2nd
Kelvin Grove Malua 4th ..	32643	273	19	7,662	4·03	308·8	230	Jr. 2	.. ..	Kelvin Grove Lotus Lad 2nd
Kelvin Grove Pearl ..	32645	273	12	5,616	4·55	256·8	230	Jr. 2	.. ..	Kelvin Grove Lotus Lad 2nd
Kelvin Grove Radiant ..	32647	240	4	6,360	4·56	290·2	310	Jr. 4	343 ..	Kelvin Grove Royalty
Kelvin Grove Rosella ..	32648	180	4	4,440	3·48	154·4	330	Sr. 4	335 ..	Alan Vale Whynot
Atkinson, W. K., Swan Hill, Dairy Shorthorn (21).										
Willow Park Blush 5th ..	1202E	273	20	11,699	3·73	435·8	350	Mature	393, 430, 428, 438, 409, 434	Willow Park Banker 2nd
Willow Park Camelia 12th	1222E	273	14	8,999	3·66	329·1	350	Mature	331, 338, 316	Willow Park Silvermine 4th
Willow Park Camelia 22nd Vol. 2D		273	12	10,281	3·20	329·4	310	Jr. 4	341, 326 ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Camelia 27th Vol. 2D		240 (Sold)	..	8,280	3·97	328·8	270	Jr. 3	273 ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Camelia 28th Vol. 2C		273	28	9,441	3·63	342·7	270	Jr. 3	.. ..	Anderson Imperial Cran 6th (Imp.)
Willow Park Comet 10th ..	532D	210	4	5,175	3·61	186·8	310	Jr. 4	335, 103 ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Countess 30th Vol. 2C		273	21	10,326	3·09	319·4	270	Jr. 3	.. ..	Anderson Imperial Cran 6th (Imp.)
Willow Park Countess 32nd Vol. 2D		273	17	8,520	3·69	314·0	250	Sr. 2	.. ..	Anderson Imperial Cran 6th (imp.)
Willow Park Countess 33rd Vol. 2D		273	14	6,693	4·13	276·4	230	Jr. 2	.. ..	Wicklesham Lord Barrington 5th (Imp.)

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Atkinson, W. K., Swan Hill, Dairy Shorthorn—*continued.*										
Willow Park Dainty 12th	540D	273	9	9,071	3·50	317·6	350	Mature	275, 359, 326, 205	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Dainty 16th	Vol. 2C	273	18	7,823	3·47	271·4	230	Jr. 2	.. ..	Anderson Imperial Cran 6th (Imp.)
Willow Park Damsel 6th ..	1267E	273	8	9,167	4·07	372·7	330	Sr. 4	218, 259, 228	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Duchess 28th ..	543D	273	25	11,778	3·79	446·0	350	Mature	239, 302, 396, 387	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Duchess 30th ..	545D	273	36	16,518	4·15	685·9	350	Mature	381, 526, 493,	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Duchess 41st	Vol. 2C	273	26	9,767	3·21	313·4	230	Jr. 2	.. ..	Anderson Imperial Cran 6th (Imp.)
Willow Park Fairy 10th ..	550D	273	30	10,734	3·65	391·6	350	Mature	269, 325, 352	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Melba 26th ..	555D	273	14	9,294	3·62	336·6	330	Sr. 4	311 ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Melba 35th ..	Vol. 2C	273	22	10,071	3·77	380·1	230	Jr. 2	.. ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Moss Rose 9th	1330E	273	33	13,634	3·48	474·3	350	Mature	414, 515, 558, 539, 439	Willow Park Reflector
Willow Park Moss Rose 17th	Vol. 2C	273	20	8,564	3·89	333·1	230	Jr. 2	.. ..	Anderson Imperial Cran 6th (Imp.)
Willow Park Queenie 43rd	Vol. 2	273	27	12,203	3·30	403·0	270	Jr. 3	370 ..	Anderson Imperial Cran 6th (Imp.)
Ballarat Orphanage, Ballarat, Jersey (17).										
Banyarra Aria 2nd ..	47113	273	28	8,559	6·37	545·3	350	Mature	274, 429, 403	Retford King Bracken
Orphanage Attraction 8th	54571	273	23	6,866	5·16	354·3	350	Mature	333, 331, 394 438	Jerseylea Quality Boy
Orphanage Attractive 8th ..	58808	273	22	9,083	5·88	534·4	330	Sr. 4	444 ..	Rowallan Celebrity
Orphanage Doris 5th ..	68457	273	24	8,118	5·85	474·8	330	Sr. 4	255, 283 ..	Jerseylea Quality Boy
Orphanage Garenne 6th ..	54577	273	24	7,662	5·44	416·9	350	Mature	336, 377, 406	Jerseylea Quality Boy
Orphanage Handsome 2nd	63534	273	13½	6,551	4·77	312·4	350	Mature	316, 385, 336	Orphanage Pride
Orphanage Melba 9th ..	63535	273	30	8,685	5·23	454·2	330	Sr. 4	471 ..	Rowallan Celebrity
Orphanage Mirthmaker 7th	58821	273	20	7,764	4·94	383·6	350	Mature	325, 425, 418	Orphanage Molly's Thorn
Orphanage Molly 5th ..	68463	273	25	8,430	5·10	430·1	350	Mature	269, 317 ..	Orphanage Molly's Thorn
Orphanage Molly 10th ..	Vol. 29	273	18	6,731	4·76	320·7	230	Jr. 2	.. ..	Banyule Terraplane
Orphanage Pearl 5th ..	41409	273	22	8,023	5·33	427·9	350	Mature	252, 419, 388, 445, 438	Orphanage Quicksand's Prince
Orphanage Quicksand 4th ..	49977	273	25½	8,732	5·31	463·7	350	Mature	394, 434, 506	Jerseylea Quality Boy
Orphanage Quicksand 13th	73308	273	22	7,598	5·89	447·4	310	Jr. 4	275, 406 ..	Retford King Bracken
Orphanage V.C.'s Molly 4th	58829	273	20	7,710	5·68	437·9	350	Mature	229, 332, 393	Rowallan Celebrity
Orphanage Zafferine 4th ..	49978	273	13	6,191	5·28	326·6	350	Mature	365, 346, 383, 421	Jerseylea Quality Boy
Tavistock V.C.'s Maid ..	64483	273	22	6,312	4·85	306·2	350	Mature	.. ..	Wompini V.C.
Uphaven Silver Dawn ..	Vol. 28	273	16	5,769	5·43	313·3	230	Jr. 2	.. ..	Banyule Terraplane
Banyule Stud Pty. Ltd. (Lyon, C. G.), Heidelberg, Jersey (5).										
Banyule Clytie	70184	273	21	6,609	5·11	337·8	230	Jr. 2	.. ..	Banyule Triplane
Banyule Molly 60th ..	56258	273	35½	9,302	5·63	523·9	290	Sr. 3	432 ..	Banyule Oxford Don
Banyule Silvermine 119th	60504	273	23	6,615	5·99	396·3	270	Jr. 3	398 ..	Banyule Triplane
Banyule Silvermine 120th	60505	273	25	6,095	5·76	350·8	270	Jr. 3	277 ..	Banyule Comet
Rowallan Silvermine 5th ..	64129	273	20	7,164	6·01	430·4	250	Sr. 2	289 ..	Banyule Oxford Don
Barkla, R. E., and Sons, Joyce's Creek, Jersey (1).										
Ismalla Petal 5th ..	67122	240	..	2,895	5·04	145·9	250	Sr. 2	140 ..	Orphanage Charger
Bennett, J. W., Yinnar, Jersey (7).										
Ellendale Bluebell 14th ..	71150	273	N.C.K.	8,216	5·31	436·3	310	Jr. 4	.. ..	Staghorn Bell Boy
Ellendale Bluebell 17th ..	Vol. 28	273	N.C.K.	7,668	5·75	440·7	270	Jr. 3	.. ..	Avalon Prince Madeira
Ellendale Kirsty 16th ..	61418	273	N.C.K.	6,768	5·46	369·8	350	Mature	.. ..	Mistletoe 2nd's Treasure of Lynuilg
Ellendale Kirsty 24th ..	61419	273	N.C.K.	8,175	4·67	382·0	330	Sr. 4	.. ..	Staghorn Bell Boy
Ellendale Romany 7th ..	61421	273	N.C.K.	8,805	4·71	414·6	350	Mature	.. ..	Staghorn Bell Boy
Ellendale Romany 11th ..	Vol. 28	273	N.C.K.	7,745	5·50	425·6	270	Jr. 3	.. ..	Avalon Prince Madeira
Ellendale Bluebell 5th ..	47970	273	N.C.K.	7,449	5·55	413·6	350	Mature	317 ..	Mistletoe 2nd's Treasure of Lynuilg
Bennett, R. H., Lancefield, Jersey (7).										
Edenhope Countess ..	66300	273	15½	6,468	5·99	387·7	310	Jr. 4	326 ..	Edenhope Masterpiece
Edenhope Lady Twylish ..	66302	273	15	6,675	6·07	404·9	310	Jr. 4	334 ..	Edenhope Masterpiece
Edenhope Madeira's Model	43666	273	16½	7,964	5·56	442·7	350	Mature	375 ..	Byland's Royalish
Edenhope Mavis	71109	273	13	6,144	5·32	326·9	250	Sr. 2	230 ..	Lancefield Madeira's Chance
Edenhope Myra	71112	273	12½	4,763	5·72	272·6	250	Sr. 2	233 ..	Lancefield Madeira's Chance
Edenhope Myrl	57122	273	23	10,715	5·56	595·4	350	Mature	453 ..	Edenhope Canary's Count
Edenhope Necklace ..	71113	273	15	6,890	5·01	345·3	250	Sr. 2	229 ..	Lancefield Madeira's Chance

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day lb. Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class	Previous Yields of Butter Fat.	Sire.
Black, Estate Late I. S., Noorat, Ayrshire (6).										
Killoch Juniper (Imp.) ..	80966	273	18	8,012	4·62	370·5	270	Jr. 3	370 ..	Burton Signet
Mount Noorat Alert 5th ..	29775	273	15	9,423	4·75	447·8	350	Mature	302, 304, 360	Gowrie Park Scottish Patron
Mount Noorat Georgina 5th	29777	273	16	9,504	4·37	415·1	350	Mature	379, 318, 466	Gowrie Park Scottish Patron
Mount Noorat Georgina 7th	30776	273	8	6,417	4·82	309·2	330	Sr. 4	375, 417 ..	Mount Noorat Loudon
Mount Noorat Georgina 8th	30777	273	22	8,817	4·39	386·8	310	Jr. 4	341, 448 ..	Mount Noorat Loudon
Mount Noorat Georgina 9th	31640	273	16½	6,635	3·70	245·7	270	Jr. 3	249 ..	Mount Noorat Laurie
Broad, Mrs. A. A., Sutton Grange, Jersey (8).										
Grangelea Begonia ..	Vol. 28	273	15	5,403	4·88	263·8	230	Jr. 2	.. ..	Grangelea Butter Boy 5th
Grangelea Bell	40060	273	13	5,951	5·60	333·4	350	Mature	302, 328, 411, 436, 438, 504, 429	Grangelea Daffodil's Airo
Grangelea Bess	61938	273	16	6,563	5·77	378·7	350	Mature	419, 401 ..	Grangelea Cream Boy
Grangelea Doris 5th ..	66755	273	12½	5,629	6·14	345·6	270	Jr. 3	.. ..	Grangelea Roderick 2nd
Grangelea Pretty Primrose 2nd	61943	273	18½	7,725	5·20	401·3	310	Jr. 4	441, 388 ..	Grangelea Daffodil's Airo
Grangelea Rebel	71630	273	16	5,886	5·24	308·7	230	Jr. 2	.. ..	Grangelea Daffodil's Airo
Grangelea Velveretta 3rd ..	71635	273	11½	4,415	5·65	249·3	230	Jr. 2	.. ..	Grangelea Daffodil's Airo
Grangelea Viola	66769	273	13½	6,635	5·08	336·8	270	Jr. 3	342 ..	Grangelea Daffodil's Airo
Broad, A. J., Pyramid, Jersey (1).										
Gladfield Daphne ..	48207	273	8	6,414	5·46	350·3	350	Mature	.. ..	Grangelea Dandy Mac
Butcher, F. T., Murraydale, Red Poll (3).										
Maryville Melba	7117C	210	4	4,755	4·07	193·6	250	Sr. 2	177 ..	Temperley Prism
Maryville Model	6911A	273	16½	8,456	4·44	375·3	270	Jr. 3	256 ..	Temperley Prism
Maryville Rennie ..	6209D	273	13	10,004	3·99	399·0	310	Jr. 4	264, 302 ..	Chandpara Ferdinand
Cannard, Mrs. M. I., Mulgrave, Jersey (2).										
Caroline Park Promise ..	70670	273	N.C.K.	4,838	5·18	250·8	250	Sr. 2	.. ..	Arranmore Premier
Sutton Lea Marmie ..	59583	273	N.C.K.	6,963	4·64	323·2	350	Mature	246, 321 ..	Sutton Lea Garnap
Chadderton, J. E., Hamilton, Jersey (1).										
Glen Leigh Dilly ..	66577	273	19	6,566	5·23	343·3	230	Jr. 2	.. ..	Glen Leigh Volunteer
Chirnside, R. M., Whittlesea, Jersey (2).										
Mornmoot Princess Madeira	37071	273	22	9,581	5·47	524·3	350	Mature	424, 572, 773, 794, 794, 520, 553, 514	Werribee Grandmaster
Mornmoot Princess Madeira 14th	63204	273	19	8,963	5·43	486·8	250	Sr. 2	372 ..	Werribee Warrior
Clarke, F. W., Toora, Jersey (4).										
Elanora Lilac 2nd ..	47937	273	N.C.K.	6,800	6·32	429·8	350	Mature	354, 449, 521, 505, 433	Burnside Harmony
Mer Vue Butterball ..	67907	273	17	6,291	6·48	407·6	290	Sr. 3	360, 287 ..	Berrington Largo
Mer Vue Choice 3rd ..	54081	273	21	7,338	5·78	424·3	350	Mature	348, 447, 512, 532, 472	Woorayl Flashlight
Mer Vue Cissie 2nd ..	67912	273	N.C.K.	7,433	5·56	413·0	250	Sr. 2	325 ..	Berrington Largo
Clark, P. W., Whittlesea, Jersey (1).										
Coodardy Janette ..	Vol. 28	273	16½	6,359	5·53	351·5	230	Jr. 2	.. ..	Werribee Centurion
Clark, W. J., Monomeith, Jersey (8).										
Glenavon Diana 14th ..	61733	273	N.C.K.	7,491	4·80	359·8	350	Mature	.. ..	Glenavon Betty's Star
Glenavon Diana 20th ..	Vol. 28	273	N.C.K.	5,243	5·70	298·6	270	Jr. 3	.. ..	Glenavon Starbright's Airshaft
Glenavon Maisie	Vol. 28	273	N.C.K.	4,224	5·22	220·4	230	Jr. 2	.. ..	Glenavon May Star
Glenavon Molly 4th ..	53829	273	N.C.K.	7,257	5·61	406·9	350	Mature	.. ..	Glenavon Starbright's Airshaft
Glenavon Molly 5th ..	66609	273	30	9,437	5·00	471·7	310	Jr. 4	.. ..	Glenavon Starbright's Airshaft
Glenavon Molly 6th ..	Vol. 28	273	N.C.K.	6,452	4·40	283·6	270	Jr. 3	.. ..	Glenavon Starbright's Airshaft
Glenavon Starbright 2nd ..	61739	273	20	10,125	5·20	526·1	350	Mature	434 ..	Banyule Airshaft
Unanderra Carmen 4th ..	46543	273	14	6,686	4·84	323·6	350	Mature	.. ..	Meridale Brightlight
Colenso, L. W. R., Alvie, Jersey (1).										
Normandie Golden Nancy	49868	273	25	9,137	5·88	537·7	350	Mature	352, 356, 352, 374, 396	Normandie Golden Peer

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Coulthard, J. J., Whittlesea, Jersey (9).										
Walamba Betsy	Vol. 28	273	8	4,389	5·63	247·0	230	Jr. 2	.. ..	Selsey Wonderful Boy
Walamba Broken Dawn ..	C.R.	273	N.C.K.	5,765	5·11	294·4	270	Jr. 3	279 ..	Selsey Wonderful Boy
Walamba Bronze Beauty ..	C.R.	273	14	7,829	5·30	415·1	290	Sr. 3	283, 342 ..	Clarendon Eyre Brigadier 3rd
Walamba Kirsty's Pride ..	69563	273	5½	4,386	5·71	250·6	330	Sr. 4	245, 279, 300 ..	Mornmoot Manifest 2nd
Walamba Lily	C.R.	273	15½	4,307	5·26	226·6	230	Jr. 2	.. ..	Clarendon Eyre Brigadier 3rd
Walamba Patsy	Vol. 28	273	14½	5,141	6·02	309·6	230	Jr. 2	.. ..	Selsey Wonderful Boy
Walamba Precious Gem ..	74397	240	4	4,005	5·22	209·1	270	Jr. 3	212 ..	Selsey Wonderful Boy
Walamba Rosy Morn ..	C.R.	273	15	4,605	6·20	285·6	250	Sr. 2	280 ..	Selsey Wonderful Boy
Wompini Lady Grey ..	64957	273	11½	4,895	6·08	297·5	330	Sr. 4	294, 268, 330	Wompini Erl King
Cowan, G. L. S., Bacchus Marsh, Friesian (5).										
Ingolston Black Nose ..	4708	273	29	12,927	3·56	460·8	350	Mature	.. ..	Cordyline Cremona Pontiac
Ingolston Segis Pearl ..	5696	273	N.C.K.	8,989	4·03	362·2	350	Mature	.. ..	Ingolston Sylvester
Pemberley Posch ..	4878	273	N.C.K.	15,039	3·15	473·6	350	Mature	.. ..	Burnbank Prince Patch
Upper Lappan Edna ..	6069	273	N.C.K.	8,883	3·56	316·0	250	Sr. 2	.. ..	Elgin Glen Segis
Upper Lappan Mage ..	C.R.	273	N.C.K.	8,342	3·31	276·1	230	Jr. 2	.. ..	Elgin Glen Segis
Crawford, Mrs. E., Traralgon, Jersey (4).										
Balneil Starbright ..	56234	240 (Herd withdrawn)	15	5,617	5·52	310·2	310	Jr. 4	253, 280 ..	Werribee War Volunteer
Balneil Valley Duchess ..	Vol. 28	273	N.C.K.	5,610	5·19	291·2	230	Jr. 2	.. ..	Werribee War Volunteer
Balneil Volunteer's Sultane	60469	273	N.C.K.	6,486	5·77	374·1	270	Jr. 3	294 ..	Werribee War Volunteer
Pine Grove Master's Madeira	36798	273	N.C.K.	7,869	5·27	414·8	350	Mature	246, 457 ..	Werribee Grandmaster
Devon Park Stud Farm (Daley, G.), Lilydale, Jersey (9).										
Belgonia Design's Empire 2nd	60535	273	N.C.K.	6,581	5·33	351·0	310	Jr. 4	284, 330 ..	Belgonia Lady's Duke
Belgonia Design's Empire 3rd	60536	273	N.C.K.	6,647	5·03	334·1	310	Jr. 4	242, 278 ..	Design's Ruler (Imp.)
Belgonia Design's Perree 2nd	56317	273	N.C.K.	5,373	5·34	286·8	350	Mature	317, 386 ..	Design's Ruler (Imp.)
Belgonia Gem's Noella 2nd	56320	273	N.C.K.	7,664	5·46	418·6	350	Mature	360, 255, 409	Design's Ruler (Imp.)
Belgonia Marie 10th ..	70239	273	N.C.K.	7,055	5·14	362·3	270	Jr. 3	268 ..	Aim High (Imp.)
Glen Iris Belle Anemone ..	71415	273	N.C.K.	9,002	4·98	448·2	310	Jr. 4	314, 421 ..	Glen Iris Bowman
Glen Iris Golden Daisy ..	71418	273	N.C.K.	4,173	6·28	262·0	270	Jr. 3	237 ..	Design's Golden Oxford (Imp.)
Karrara Fancy Madeira ..	67354	273	N.C.K.	10,994	5·30	583·0	310	Jr. 4	446, 652 ..	Victorious Pioneer (Imp.)
Karrara Perree's Tecoma ..	67356	273	N.C.K.	5,330	6·56	349·6	310	Jr. 4	313, 350 ..	Springhurst Perree's Quality
Dennis, Mrs. A. A., Frankston, Jersey (3).										
Ballam Lilac Domino ..	65286	273	18	6,503	6·64	431·5	250	Sr. 2	335 ..	Clarendon Eyre Oxford Observer
Clarendon Eyre Rose Marie 11th	52266	273	17½	7,199	5·40	388·6	350	Mature	.. ..	Rochett's Golden (Imp.)
Clarendon Eyre Sweet Lavender 7th	61097	273	9	5,324	6·00	319·3	290	Sr. 3	349 ..	Rochett's Golden (Imp.)
Department of Agriculture, Burnley, Jersey (1).										
Victoria Flirt	33272	273	5	6,303	6·12	385·9	350	Mature	359, 390, 484, 485, 513, 517, 614, 429	Victoria Jack Tar
Department of Agriculture, Werribee, Friesian (8).										
Victoria Actress	6072	240	4	6,690	3·60	240·6	270	Jr. 3	303 ..	Rupertswood Inka Jo
Victoria Belfry	5104	273	52½	18,458	3·60	664·4	350	Mature	371, 507, 468, 557	Victoria Joyous Mercedes
Victoria Choir	6077	273	32	9,863	3·76	370·7	250	Sr. 2	.. ..	Rupertswood Inka Jo
Victoria Guitar	6085	273	17	8,526	3·64	310·5	230	Jr. 2	.. ..	Victoria Mikado
Victoria Josephine ..	Vol. 15	273	22	7,806	3·90	304·4	230	Jr. 2	.. ..	Victoria Conductor
Victoria Mabel	6092	240	4	8,040	3·30	265·7	330	Sr. 4	335, 336 ..	Victoria Double Top
Victoria Rita	6097	273	24	13,727	3·41	468·0	270	Jr. 3	285 ..	Rupertswood Inka Jo
Victoria Songbird ..	6098	273	4	9,402	3·53	332·0	270	Jr. 3	260 ..	Rupertswood Inka Jo
Department of Agriculture, Werribee, Red Poll (11).										
Victoria Albatross ..	6707AA	273	4	7,860	4·76	374·3	330	Sr. 4	249, 282 ..	Chandpara Valentine
Victoria Bessie	7009A	273	17	11,468	3·93	450·4	330	Sr. 4	316, 339 ..	Woodburn Peter Pan
Victoria Chest	7011A	273	26	9,558	4·51	430·7	310	Jr. 4	252 ..	Chandpara Valentine
Victoria Energy	Vol. 11	273	22	7,826	5·32	416·2	230	Jr. 2	.. ..	Woodburn Peter Pan
Victoria Honey	C.R.	273	24½	6,869	4·98	342·0	230	Jr. 2	.. ..	Woodburn Peter Pan
Victoria Lady Petrina ..	6022A	273	7½	7,811	4·05	316·2	350	Mature	340, 381, 412	Woodburn Peter Pan
Victoria Maid Marion ..	5690AA	273	5	7,499	4·66	349·3	350	Mature	316, 437, 445, 426	Woodburn Peter Pan

STANDARD HERD RECORDS—*continued.*

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required	Class.	Previous Yields of Butter Fat.	Sire.
Department of Agriculture, Werribee, Red Poll—*continued.*										
Victoria Plum	7020A	273	19½	9,869	4·23	417·4	290	Sr. 3	264, 315	Woodburn Peter Pan
Victoria Royal Red Cross	4506AA	273	8	9,360	4·00	374·3	350	Mature	214, 304, 323, 295, 344	Victoria Royal Ringer
Victoria Stiletto	Vol. 11	273	N.O.C.	5,555	5·40	300·2	230	Jr. 2	..	Woodburn Peter Pan
Victoria Volt	4049B	273	26½	10,521	4·15	436·5	350	Mature	296, 369, 399, 515, 537, 512, 490	Victoria Vice Captain
Dookie Agricultural College, Dookie, Ayrshire (4).										
Dookie Adorn	32241	273	19½	8,640	4·16	359·7	310	Jr. 4	324	Tregorland Indispensible
Dookie Alexandra	32242	273	15	7,136	3·96	282·5	310	Jr. 4	325	Dookie Shirley's Boy
Dookie Peony	30383	273	20½	9,312	4·18	389·6	350	Mature	379, 575	Longerenong Baron
Dookie Siren	33481	273	12	4,671	3·87	180·7	230	Jr. 2	..	Gowrie Park Bonnie Sailor
Dunmore, T. J., Melton, Jersey (3).										
Laura Dell Doreen	Vol. 28	273	20	4,266	5·55	236·6	230	Jr. 2	..	Avalon Gladstar 34th
Laura Dell Gladena	72360	273	13	6,279	5·72	358·9	250	Sr. 2	..	Avalon Gladstar 34th
Laura Dell Lillibet	72361	273	16	6,642	6·13	406·9	270	Jr. 3	..	Clarendon Eyre Eminent's L'Aiglon
Elteringham, W. B., Lilydale, Jersey (1).										
Heathermont Countess 2nd	66928	240 (Sold)	..	5,265	5·61	295·6	290	Sr. 3	341	Glenvalley Masterman
Enders, N. H., Stanhope, Jersey (1).										
The Wattles Moleen 5th	74164	273	16	5,868	5·90	346·0	230	Jr. 2	..	The Wattles Silver Gamboge
Everist, F. R., Tyabb, Red Poll (1).										
Chota Wallak Vicereine	Vol. 11	273	N.C.K.	3,925	4·54	178·0	230	Jr. 2	..	Victoria Gallant
Faderson, J. H., Mandurang, Jersey (5).										
Banyule Silvermine 98th	51657	240	4	3,750	5·64	211·4	350	Mature	263, 384	Oxford Beau's Pretty Oxford (Imp.)
Grovelea May Morn	62016	273	N.C.K.	4,631	4·98	230·4	350	Mature	297, 302	Mornmoot Monarch 2nd
Mandurang May Morn	C.R.	273	N.C.K.	4,305	4·16	179·0	230	Jr. 2	..	Grovelea Golden Boy
Mandurang Silvermine 2nd	C.R.	273	N.C.K.	3,437	4·53	155·7	230	Jr. 2	..	Banyule Battledore
The Wattles Petal 6th	69347	273	N.C.K.	5,039	5·01	252·7	270	Jr. 3	468	The Wattles Silver Gamboge
Fairchild and Clutterbuck, Tinambra, Jersey (12).										
Carrellen Wyandotte	65881	273	22	7,626	5·41	412·3	270	Jr. 3	353	Darnum Park Lord Starbright
Fairbank Queenie 3rd	61572	273	N.C.K.	4,291	5·84	250·4	330	Sr. 4	276, 343	Fairbank Chorus
Vaucluse Daphne 2nd	65922	273	N.C.K.	6,618	5·91	391·4	310	Jr. 4	326, 293	Glen Iris Violin
Vaucluse Daphne 3rd	74351	273	N.C.K.	7,538	5·40	407·2	270	Jr. 3	325	Glen Iris Violin
Vaulcuse Daphne 4th	Vol. 28	273	N.C.K.	6,254	5·08	317·8	230	Jr. 2	..	Vaucluse Masterpiece
Vaucluse Duchess 4th	Vol. 28	273	N.C.K.	5,105	5·49	280·4	230	Jr. 2	..	Paisley Master
Vaucluse Empress 7th	Vol. 28	273	N.C.K.	5,772	5·16	297·9	230	Jr. 2	..	Vaucluse Masterpiece
Vaucluse Kirsty 3rd	74353	273	N.C.K.	6,864	5·54	380·3	250	Sr. 2	304	Glen Iris Violin
Vaucluse Tilly 2nd	C.R.	273	N.C.K.	7,181	4·44	318·6	230	Jr. 2	..	Vaucluse Masterpiece
Vaucluse Tinsel 2nd	69524	273	23	7,961	5·81	462·9	310	Jr. 4	345, 446	Paisley Master
Vaucluse Tinsel 3rd	74354	273	18	7,133	5·89	420·2	270	Jr. 3	331	Paisley Master
Vaucluse Tinsel 4th	Vol. 28	273	N.C.K.	6,073	5·22	317·1	230	Jr. 2	..	Vaucluse Masterpiece
Fixter, A., Boisdale, Guernsey (1).										
Avonview Golden Fairy	3967	273	19	8,747	5·81	508·4	350	Mature	455, 513	Avonview Golden Lord
Foster, A. O., Boisdale, Jersey (9).										
Boisdale Beauty 4th	Vol. 28	273	N.C.K.	4,136	5·80	240·0	230	Jr. 2	..	Boisdale Masterpiece
Boisdale Brunette 6th	C.R.	273	N.C.K.	3,542	6·27	222·0	230	Jr. 2	..	Boisdale Masterpiece
Boisdale Duchess 4th	Vol. 28	273	N.C.K.	3,900	5·93	231·4	230	Jr. 2	..	Boisdale Masterpiece
Boisdale Duchess 5th	C.R.	273	8	4,091	5·48	224·0	230	Jr. 2	..	Boisdale Grey Night
Boisdale Gift 2nd	C.R.	273	5	3,107	5·86	182·0	230	Jr. 2	..	Boisdale Master's Lad
Boisdale Goldfinch	Vol. 28	273	N.C.K.	4,208	5·76	242·3	350	Mature	193, 246, 280,	Boisdale Dazzler
Boisdale Neat 2nd	Vol. 28	273	N.C.K.	4,116	6·40	263·3	230	Jr. 2	..	Boisdale Master's Lad
Boisdale Nymph 3rd	C.R.	273	N.C.K.	2,717	6·25	169·8	230	Jr. 2	..	Boisdale Masterpiece
Boisdale Sweet Girl	70395	180	N.C.K.	2,175	5·20	113·1	290	Sr. 3	181	Boidsale Lord
Freestone, P. A., Murchison, Jersey (1).										
Audley Lily 2nd	C.R.	240 (herd withdrawn)	..	5,220	5·46	285·2	250	Sr. 2.	..	Audley Golden Lad
Gay, R. G., and Son, Yarram, Jersey (4).										
Elm Grove Golden Dawn	71180	273	21½	8,555	4·84	414·1	270	Jr. 3	369	Glen Iris Golden Man
Elm Grove Island Queen	61464	273	10	7,463	5·90	440·6	350	Mature	281, 340, 485	Werribee Island King
Elm Grove Lady Loch 2nd	52628	273	19	9,086	4·96	451·0	350	Mature	313, 339, 359, 434	Goldstar of Melrose
Elm Grove Linda	43737	273	19	9,717	5·13	498·7	350	Mature	285, 424, 494, 403, 468, 538	Goldstar of Melrose

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	No of Days in Test.	Milk Last Day lb. Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class	Previous Yields of Butter Fat.	Sire.
Goddard, J. H., Cora Lynn, Ayrshire (2).										
Inverurie Countess ..	33745	273	32	9,681	5·17	500·3	230	Jr. 2	.. ..	Strathaven Farm Boy
Inverurie Hester ..	31544	273	20	12,722	4·66	593·3	310	Jr. 4	412, 592 ..	Crescent Farm Amber
Grice, C. S., Somerville, Jersey (2).										
Glenoma Heroine ..	Vol. 28	273	15	4,455	7·05	314·2	230	Jr. 2	.. ..	Clarendon Eyre Eminent's Barrister 9th
Willis Vale L'Aiglon Capture	69715	273	30	9,765	4·58	447·1	290	Sr. 3	375 ..	Clarendon Eyre Eminent's L'Aiglon 6th
Handbury, J. E., and Son, Toora, Jersey (3).										
March Galinthia (Imp.) ..	56052	273	29	9,353	5·21	487·0	350	Mature	.. ..	Dreaming Royalist
Tooravale Lassie 17th ..	55580	273	N.C.K.	9,785	5·40	528·6	350	Mature	318, 423, 458, 482 ..	Kingsvale Monica 14th's Son
Tooravale Princess 25th ..	Vol. 28	273	N.C.K.	8,364	5·42	453·6	310	Jr. 4	.. ..	Pinewoods Aristocrat (Imp.)
Harvey, T., Boisdale, Jersey (12).										
Jerseyholm Bluebell 21st ..	53355	273	N.C.K.	4,499	5·11	230·1	350	Mature	273, 338, 316, 343	Werribee Master's Fox
Jerseyholm Bluebell 33rd ..	62305	273	N.C.K.	5,873	5·14	310·7	310	Jr. 4	255, 297 ..	Jerseyholm Master's Fox 35
Jerseyholm Bluebell 34th ..	62306	273	N.C.K.	6,023	5·82	350·8	310	Jr. 4	300, 353 ..	Mormnoot Mars
Jerseyholm Bluebell 37th ..	62308	273	N.C.K.	5,892	5·11	301·2	270	Jr. 3	358 ..	Banyule Biplane
Jerseyholm Bluebell 38th ..	67185	273	N.C.K.	4,557	5·29	241·0	270	Jr. 3	262 ..	Banyule Biplane
Jerseyholm Bluebell 39th ..	67186	273	N.C.K.	6,110	5·64	344·9	270	Jr. 3	332 ..	Rowallan Silvanite
Jerseyholm Bluebell 47th ..	71962	273	11	6,078	5·26	319·9	230	Jr. 2	.. ..	Glen Iris Royal Archer
Jerseyholm Empress 55th ..	62312	273	14	7,724	4·81	371·2	310	Jr. 4	346 ..	Mormnoot Mars
Jerseyholm Empress 59th ..	67192	273	N.C.K.	3,222	4·81	154·9	250	Sr. 2	229 ..	Banyule Biplane
Jerseyholm Empress 65th ..	71969	273	N.C.K.	5,075	4·60	233·4	230	Jr. 2	.. ..	Orphanage Molly's Commander
Jerseyholm Kirsty 38th ..	62316	273	N.C.K.	5,516	5·17	285·3	290	Sr. 3	282, 331 ..	Jerseyholm Master's Fox 35
Jerseyholm Lady Marge 17th	67197	273	N.C.K.	2,757	4·76	131·2	250	Sr. 2	278 ..	Rowallan Silvanite
Haywood, Dr. A. R., Hastings, Jersey (8).										
Glen Iris Royal Viola ..	71422	273	N.C.K.	7,590	5·62	426·4	270	Jr. 3	323 ..	Glen Iris Royal Gallant
Windrest Chevy's Madeira	69731	273	N.C.K.	8,264	5·72	472·8	310	Jr. 4	313, 307 ..	Windrest Prince Madeira
Windrest Chevy's Maiden	Vol. 28	273	N.C.K.	8,331	5·62	467·9	230	Jr. 2	.. ..	Gadget (Imp.)
Windrest Gay Marie 2nd ..	74578	273	N.C.K.	8,346	6·14	512·3	270	Jr. 3	402 ..	Gadget (Imp.)
Windrest Island Goldmine ..	69733	273	N.C.K.	11,586	5·20	602·2	310	Jr. 4	319, 430 ..	Gadget (Imp.)
Windrest Island Serene ..	Vol. 28	273	N.C.K.	8,303	5·57	462·4	230	Jr. 2	.. ..	Gadget (Imp.)
Windrest Rose Marie ..	55878	273	N.C.K.	11,327	5·46	618·1	350	Mature	231, 306, 464, 481, 515	Clarendon Eyre Eminent's Achievement
Windrest Twinkle's Charm ..	74584	273	N.C.K.	9,348	6·07	567·2	270	Jr. 3	391 ..	Gadget (Imp.)
Henderson W., Grassmere, Ayrshire (8).										
Carracoorte Balm 18th ..	27003	240	4	5,190	4·86	252·2	350	Mature	305, 236, 182, 358	Gerty's Producer of Carracoorte
Carracoorte Balm 25th ..	30254	240	4	4,905	4·28	209·8	330	Sr. 4	182, 284 ..	Grandview Bernie
Carracoorte Blanche 15th ..	33345	240	4	4,920	4·71 ..	231·6	290	Sr. 3	.. ..	Carracoorte Boomerang
Carracoorte Briar Bud 5th ..	30257	240	4	6,081	4·29	261·0	350	Mature	213, 402 ..	Carracoorte Belle's Victory
Carracoorte Bunty 32nd ..	C.R.	240	4	3,345	4·65	155·4	270	Jr. 3	.. ..	Carracoorte St. Bernard
Carracoorte Viola 26th ..	30266	240	4	3,585	5·66	203·0	350	Mature	101, 251, 239, 254, 200, 289	Carracoorte Pilot
Carracoorte Viola 28th ..	27014	240	4	3,885	4·98	193·6	350	Mature	288, 310, 342, 267	Carracoorte Blue Bell's Favourite
Rivery Park Necklace ..	26701	240	4	4,860	4·51	219·0	350	Mature	274 ..	Carracoorte Lucifer
Higgins, J. A. A., Keysborough, Guernsey (2).										
Brightonvale Foxglove ..	8369	273	N.C.K.	5,199	4·03	256·4	230	Jr. 2	.. ..	Melbourne Golden Power
Melbourne Dorimene ..	5804	273	N.C.K.	5,942	5·14	305·1	330	Sr. 4	335 ..	Woodlands Fleur-de-Lys (Imp.)
Hodgins, G. E., Hastings, Jersey (3).										
Verjean Venture	74362	273	22	6,741	4·22	284·3	230	Jr. 2	.. ..	Jorian Great Boy
Verjean Viscountess ..	74367	273	9	4,589	5·77	264·7	230	Jr. 2	.. ..	Ardleigh's Prince Chut
Werribee Stellar Princess ..	37073	273	24½	10,301	5·35	551·1	350	Mature	440, 536, 574, 736, 647 ..	Werribee Butter King
Hore, E., Leitchville, Jersey (5).										
Milvue Coronation Queen 2nd	Vol. 28	273	7½	3,990	5·23	208·8	230	Jr. 2	.. ..	Milvue Lucky Lad
Milvue Design's Lily ..	Vol. 28	273	18	6,524	4·82	314·5	230	Jr. 2	.. ..	Belgonia Suspense's Design
Milvue Honesty	58462	273	21½	8,342	5·22	435·7	350	Mature	313, 363, 439	Clarendon Eyre Eminent's Lion 5th
Milvue Roscleaf 2nd ..	58468	273	23½	9,570	4·80	459·1	350	Mature	356, 378, 467	Milvue Christmas Melody
Tavestock Valarie ..	55444	273	17	6,036	5·24	316·3	350	Mature	324, 441, 502, 382, 388 ..	Werribee Ranger

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Hore, M. T., Horfield, Friesian (7).										
Elmar Frescoline ..	C.R.	273	35	13,340	3·05	406·6	350	Mature	371, 514 ..	Elmar Sylvia's Lad
Elmar Kiltie	Vol. 15	273	N.C.K.	7,206	3·68	265·1	230	Jr. 2	.. ..	Burnbank Iona Rock
Elmar Onia Beets ..	5458	273	N.C.K.	13,089	3·84	503·3	350	Mature	339, 298 ..	Greenvale Oakwood Posch
Elmar Roseleaf	5460	273	N.C.K.	10,991	3·75	411·8	350	Mature	378, 346 ..	Greenvale Oakwood Posch
Elmar Sylvia	C.R.	273	N.C.K.	11,394	3·27	372·9	350	Mature	318 ..	Greenvale Oakwood Posch
Elmar Trixie	C.R.	273	N.C.K.	11,802	3·48	410·8	330	Sr. 4	240, 386 ..	Elmar Sylvia's Lad
Greenvale Flora	App. 2 (Vol. II)	273	N.C.K.	11,266	3·22	363·0	350	Mature	484, 390, 453, 556, 467	Victoria Double Oak De Kol
Huffer, J. A., Gormandale, Jersey (4).										
Glenvalley Blossom ..	61862	273	N.C.K.	8,781	5·82	511·0	350	Mature	231, 377, 407	Glenvalley Sir Roger 2nd
Glenvalley Handsome Girl 6th	71544	273	N.C.K.	5,381	6·13	329·6	270	Jr. 3	284 ..	Glenvalley Mercedes' Chief
Glenvalley Pet	66698	273	N.C.K.	8,336	5·11	426·3	310	Jr. 4	248, 303 ..	Glenvalley Sir Roger 2nd
Glenvalley Waverley Lass 9th	Vol. 28	273	N.C.K.	5,711	5·82	332·2	230	Jr. 2	.. ..	Yulebar Fancy Twylish 3rd
Hurrey, Estate of the late W. H., Koonwarra, Jersey (11).										
Burwood Cream Belle 4th ..	60927	273	N.C.K.	5,595	6·53	365·2	350	Mature	273, 338, 385	Kooreena Handsome Lad
Burwood Mourier Belle 2nd	60930	273	12	5,646	6·62	373·7	350	Mature	275, 337, 291	Kooreena Handsome Lad
Kooreena Audrey 7th ..	49031	273	12	7,344	6·44	473·2	350	Mature	343, 435, 381, 426, 299	Kooreena Carrie 3rd's Delegate
Kooreena Audrey 16th ..	Vol. 28	273	16	4,475	5·91	264·3	230	Jr. 2	.. ..	Kooreena Rover 3rd
Kooreena Lady 5th Dame ..	C.R.	273	13	5,244	5·43	284·7	270	Jr. 3	.. ..	Kooreena Good Luck
Kooreena Miriam ..	67488	273	N.C.K.	4,958	6·16	305·6	310	Jr. 4	244, 302 ..	Kooreena Handsome Lad
Kooreena Mourier Queen 15th	Vol. 28	273	10	5,265	6·24	328·6	270	Jr. 3	.. ..	Kooreena Good Luck
Kooreena Tinkling Belle ..	72281	273	N.C.K.	6,584	6·30	414·5	270	Jr. 3	391 ..	Kooreena Roger 3rd
Kooreena Yo Yo 2nd ..	58059	273	13	4,944	5·95	294·2	350	Mature	346, 361, 321, 340	Kooreena Mourier King 2nd
Kooreena Yo Yo 4th ..	67489	273	N.C.K.	5,718	6·45	368·7	310	Jr. 4	353 ..	Kooreena Good Luck
Kooreena Yo Yo 6th ..	72282	273	12	4,728	6·47	305·8	270	Jr. 3	291 ..	Kooreena Rover 3rd
Hutchinson, H. McD., Yan Yean, Jersey (1).										
Eulomo Aldan Duchess ..	Vol. 28	273	17	6,413	5·47	351·1	230	Jr. 2	.. ..	Staghorn Lord Aldan 3rd
Jeffreson, E. L., Dandenong, Jersey (1).										
Finchley Handsome Girl 2nd	66458	273	8	3,054	6·69	204·4	250	Sr. 2	344 ..	Finchley Vasilika's Masterpiece
Jones, A. C., Barnawatha, Illawarra Shorthorn (6).										
The Forest Caroline 4th ..	C.R.	273	N.C.K.	4,527	3·98	180·4	230	Jr. 2	.. ..	The Forest Passport
The Forest Tiny 9th ..	Vol. 8	273	N.C.K.	5,999	3·74	224·2	230	Jr. 2	.. ..	The Forest Passport
Wangoola Buttercup 2nd ..	28432	240	N.C.K.	5,565	4·34	241·8	290	Sr. 3	268 ..	Wangoola Rose's Discovery
Wangoola Gold	28438	273	N.C.K.	8,448	3·65	308·4	270	Jr. 3	275 ..	Hillview Renown's Combination
Wangoola Renown's Tiny ..	Vol. 8	273	N.C.K.	5,223	3·53	184·2	310	Jr. 4	215 ..	Hillview Renown's Combination
Coraldale Melba 9th ..	Vol. 8	210 (Sold)	..	4,635	3·58	165·8	250	Sr. 2	.. ..	Sunnyvale David
Langlands, F. B., Horsham, Jersey, (1).										
Brierwood Flower Girl 4th ..	Vol. 28	273	N.C.K.	5,864	4·95	290·1	310	Jr. 4	.. ..	Orphanage Lady's Vanguard
Le-Noury, E., Werribee South, Guernsey (3).										
Cleveland Melody ..	6927	273	N.C.K.	5,166	4·77	246·4	310	Jr. 4	284 ..	Melbourne Peter Pan
Melbourne Bellbird ..	3624	273	N.C.K.	7,151	4·06	290·7	350	Mature	291 ..	Melbourne Sandboy
Werribee Royal Maid ..	9642	273	N.C.K.	4,733	4·90	231·7	230	Jr. 2	.. ..	Werribee Prince Don
Lind, A. E., and Sons, Mount Taylor, Jersey (3).										
Latrobe Statuette 3rd ..	37606	273	25	10,697	5·02	537·0	350	Mature	260 ..	Banyule Joystick
Latrobe Statuette 5th ..	49113	273	23	9,369	5·74	537·9	290	Sr. 3	.. ..	Latrobe Aircloud
Latrobe Statuette 13th ..	67561	273	21	8,373	5·74	480·7	290	Sr. 3	.. ..	Banyule Ettie's Oxford
Lirke, H. P., Tarrington, Dairy Shorthorn (1).										
Corresdean Beauty ..	Vol. 2E	273	20½	8,041	3·76	302·4	350	Mature	.. ..	Willow Park Revenue 2nd
Longerenong Agricultural College, Dooen, Ayrshire (1).										
Longerenong Cootamundra Wattle 6th	32770	273	14	5,419	4·31	233·5	230	Jr. 2	.. ..	Dookie Signet
Lyon, W. H., Sale, Jersey (13).										
Avon Betty	51568	273	N.C.K.	7,131	5·49	391·4	350	Mature	205, 345 ..	Ruby's Beau (Imp.)
Avon Blossom	65242	273	N.C.K.	6,459	5·68	367·0	310	Jr. 4	.. ..	Ruby's Beau (Imp.)
Avon Boronia	56195	273	N.C.K.	5,720	5·39	308·2	350	Mature	298 ..	Ruby's Beau (Imp.)
Avon Dodo	70073	273	N.C.K.	6,602	6·26	413·2	310	Jr. 4	.. ..	Ruby's Beau (Imp.) ..
Avon Dora	Vol. 28	273	N.C.K.	6,170	5·49	338·6	290	Sr. 3	.. ..	Studleigh Lord Madeira
Avon Empress	Vol. 28	273	N.C.K.	6,971	4·54	316·2	310	Jr. 4	.. ..	Studleigh Lord Madeira

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.		Sire.
Lyon, W. H., Sale, Jersey—*continued.*											
*Avon Fancy Mabel ..	Vol. 28	246	..	5,670	5·39	305·6	330	Sr. 4	..	..	Studleigh Lord Maderia
Avon Lady Love ..	65246	273	N.C.K.	6,713	5·49	368·4	290	Sr. 3	..	..	Ruby's Beau (Imp.)
Avon Lala	C.R.	273	N.C.K.	7,278	6·06	441·1	350	Mature	..	..	Staghorn Larkspur Majesty
Avon Nerine	65248	273	N.C.K.	6,275	5·68	356·7	310	Jr. 4	..	..	Ruby's Beau (Imp.)
Avon Princess Doona ..	Vol. 28	273	N.C.K.	4,191	6·44	269·8	230	Jr. 2	..	..	Ruby's Beau (Imp.)
Avon Rose 4th	47074	273	N.C.K.	8,084	4·95	399·9	350	Mature	300, 339, 423		Melrose Jessie 13th's Count
Avon Ruby's Golden ..	65249	273	N.C.K.	5,738	5·86	336·3	310	Jr. 4	..	..	Ruby's Beau (Imp.)
				* (Sold)							
Macauley, C. W., Rochester, Jersey (3).											
Taranah Fair Lady 3rd ..	69222	273	12½	5,936	5·49	325·8	310	Jr. 4	359, 384	..	Werribee Bluebell's Masterpiece
Taranah Fair Lady 5th ..	C.R.	273	12½	5,453	5·79	315·9	230	Jr. 2	..	..	Taranah Champion
Taranah Floss 4th ..	74083	273	10½	5,324	5·16	274·7	270	Jr. 3	320	..	Werribee Bluebell's Masterpiece
McCormack, M., and Sons, Mansfield, Red Poll (3).											
Cypress Cherryleaf ..	6386AA	273	N.C.K.	8,268	3·37	278·5	250	Sr. 2	..	..	Blackwood Parody
Cypress Jessie	5766A	240	4	5,617	4·04	226·8	350	Mature	..	..	Northwood Prior
Henham Lulu	4382AA	240	4	6,600	3·22	212·5	350	Mature	..	..	Glevering Pelican
McErvale, I., and Sons, Camperdown, Jersey (6).											
Airlie Isla 3rd	38652	240	4	4,845	4·47	216·5	350	Mature	359, 353, 258		Hedge of Banyule
Cumnock Astra	57024	273	20	7,383	5·10	376·5	350	Mature	264	..	Cumnock Fancy Masterpiece
Cumnock Bettws-y-Coed ..	66121	273	11	4,373	5·56	243·2	290	Sr. 3	..	..	Staghorn Prince Clementine
Cumnock Bettws-y-Coed 2nd	C.R.	273	18½	6,507	4·88	317·5	230	Jr. 2	..	..	Staghorn Prince Clementine
Cumnock Jersey Lily ..	61243	273	21	7,560	5·08	384·3	350	Mature	312	..	Cumnock Masterman
Glen Iris Design's Finesse	43966	273	14½	6,718	5·04	338·6	350	Mature	337	..	Design's Ruler (Imp.)
McNabb, G. A., and Son, Irrewillipe East, Jersey (5).											
Clarendon Eyre Merry Widow 9th	Vol. 28	273	N.C.K.	6,435	6·08	391·1	270	Jr. 3	..	..	Rochett's Golden (Imp.)
Maxon Bright Daisy 4th ..	72712	273	N.C.K.	5,460	5·66	308·8	230	Jr. 2	..	..	Maxon Starbright's Prince 5th
Maxon Count's Marie ..	49424	273	N.C.K.	7,376	5·44	400·9	350	Mature	210, 331, 313, 314, 504		Maxon Count Graceful
Maxon Noble's Ladie 2nd	58357	273	N.C.K.	7,154	5·58	398·9	350	Mature	310, 259, 429		Avalon Noble 8th
Mornmoot Clementine 12th	68089	273	N.C.K.	6,123	5·04	308·3	230	Jr. 2	..	..	Clarendon Eyre Ruddigore 5th
Maloney, P. J., Tongala, Jersey (2).											
Belgonia Buttercup 5th ..	70222	273	N.C.K.	8,142	5·96	485·5	270	Jr. 3	402	..	Aim High (Imp.)
Belgonia Empire 2nd ..	70229	273	N.C.K.	8,723	5·26	458·9	270	Jr. 3	391	..	Aim High (Imp.)
Mason, V. J., Ferntree Gully, Guernsey (2).											
Osmaine Patty	7713	273	N.C.K.	10,005	5·73	573·6	290	Sr. 3	443	..	Yarraview Night March
Roads End Printemps ..	4807	273	N.C.K.	9,864	4·83	476·5	350	Mature	..	..	Glenburne Ideal (Imp.)
Masters, S. H., and Son, Swan Hill, Jersey (1).											
Rutlands Brunette 21st ..	Vol. 28	273	18	6,957	4·63	322·1	230	Jr 2	..	..	King's Vale Lauder
Meaklim Bros., Mooroopna, Dairy Shorthorn (9).											
Drumneil Alice	Vol. 2	273	17	7,373	3·52	259·6	250	Sr. 2	..	..	Drumneil Bounty
Drumneil Damsel 2nd ..	Vol. 2	273	5	5,552	4·03	224·0	270	Jr. 3	..	..	Willow Park Lustre 3rd
Drumneil Daisy 4th ..	Vol. 2	273	18	9,449	3·73	352·3	270	Jr. 3	288	..	Willow Park Lustre 3rd
Drumneil Dulcie	C.R.	273	7	7,796	3·22	250·7	290	Sr. 3	312	..	Willow Park Lustre 3rd
Drumneil Nellie	777E	273	16	8,418	4·25	357·5	350	Mature	368	..	Darbalara Bounty
Drumneil Nellie 6th ..	Vol. 2	273	16½	8,046	3·97	319·7	230	Jr. 2	..	..	Willow Park Lustre 3rd
Drumneil Pearl 4th ..	Vol. 2	273	14	6,074	3·80	230·7	230	Jr. 2	..	..	Willow Park Lustre 3rd
Drumneil Princess 7th ..	Vol. 2	273	20½	8,717	4·25	370·6	270	Jr. 3	314	..	Willow Park Lustre 3rd
Drumneil Snowdrop 2nd ..	790E	273	17	9,618	3·96	381·0	350	Mature	380	..	Drumneil Bounty 2nd
Methodist Central Mission, Lilydale, Guernsey (1).											
Melbourne Lady Belle ..	8966	273	8	3,414	5·08	173·5	230	Jr. 2	..	..	Woodlands Fleur-de-Ly (Imp.)
Mitchell, R. H., Linton, Jersey (2).											
Clifford Farm Norma ..	61102	273	20	8,537	6·35	541·9	330	Sr. 4	375, 286, 532		Wompini V.C.
Clifford Farm Joyous Melody	52272	273	22	8,535	5·77	492·2	350	Mature	379, 403, 459, 539		Wompini V.C.
Moore, J., and Co., Yarram, Jersey (3).											
Rydon Belle	41920	273	9	5,847	4·83	282·6	350	Mature	347, 400, 355, 345, 350, 266		Melrose Migrant
Tooloonook Molly 19th ..	Vol. 28	273	9	4,017	4·90	197·0	230	Jr. 2	..	..	Belgonia Lady's Duke
Tooloonook Trixie 24th ..	74217	240	4	3,810	5·32	202·7	270	Jr. 3	254	..	Belgonia Lady's Duke

STANDARD HERD RECORDS—*continued.*

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day lb. Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class	Previous Yields of Butter Fat.	Sire.
Murdoch, J., and Son, Lismore, Jersey (1).										
Ismalia Countess 4th ..	71887	273	14	5,234	6·10	319·2	230	Jr. 2	.. ..	Orphanage Charger
Nancarrow Bros., Kerang, Jersey (5).										
Pine Ridge Dream Girl 4th	68646	273	21	8,568	5·03	431·1	250	Sr. 2	404 ..	Duke of the Lake (Imp.)
Pine Ridge Duchess 3rd ..	68647	273	9	8,642	5·44	470·0	290	Sr. 3	398, 417 ..	Duke of the Lake (Imp.)
Pine Ridge Duke Silvermine	68649	273	23	10,559	5·08	536·4	290	Sr. 3	371, 472 ..	Duke of the Lake (Imp.)
Pine Ridge Hawthorn 2nd	63730	273	27	10,019	5·03	504·0	350	Mature	296, 432, 495	Duke of the Lake (Imp.)
Pine Ridge Silvermine 4th	63734	273	31	9,290	6·04	561·2	330	Sr. 4	295, 467 ..	Duke of the Lake (Imp.)
Nash, L., Launching Place, Jersey (4).										
Devon Glen Marchflower ..	66219	240 (Sold)	..	7,980	4·00	319·3	310	Jr. 4	.. ..	Glenhope Noble Butterwinks
Mornmoot Clementine 6th	58562	180	N.C.K.	4,215	4·08	172·0	290	Sr. 3	303 ..	Werribee Warrior
Mornmoot Princess Madeira 10th	58570	248	N.C.K.	5,969	4·80	286·3	310	Jr. 4	351 ..	Werribee Warrior
Pineleigh Marchflower ..	45729	273	N.C.K.	6,158	5·46	336·5	350	Mature	291, 276 ..	Wattle Park Alladin
Nicholas, M. A., Sherbrook, Jersey (7).										
Brampton Champion's Girl (Imp.)	56093	273	11½	6,665	4·73	315·5	350	Mature	457, 398 ..	Brampton Son of Champions
Brampton Standard Nelly (Imp.) ..	56050	273	6½	6,254	5·64	352·6	350	Mature	285, 314, 327	Brampton Sporting Standard
Selsey Fancy Wyandotte ..	64219	273	4	5,307	5·73	304·2	290	Sr. 3	322, 346 ..	Selsey Great Master
Selsey Golden Rose ..	69062	273	15½	6,843	5·28	361·3	270	Jr. 3	322 ..	Samare's Golden Prince (Imp.)
Selsey Princess Wyandotte	64223	273	16½	6,912	6·09	421·0	310	Jr. 4	382, 390 ..	Selsey Brampton Boy
Selsey Roseleaf 3rd ..	59413	273	10	7,766	5·50	427·4	330	Sr. 4	335, 308, 299	Brampton Great Boy (Imp.)
Selsey Samare's Wyandotte	69071	273	12	5,262	6·41	337·5	270	Jr. 3	407 ..	Samare's Golden Prince (Imp.)
Noble, T. M., and Sons, Maffra, Jersey (8).										
Finchley Lillian 2nd ..	61608	273	N.C.K.	7,959	5·27	419·1	350	Mature	335, 432, 442	Werribee Lord Burnham
Finchley Master's Canary	52727	273	19	7,904	6·64	525·2	350	Mature	388, 477, 481, 470, 564	Finchley Masterman
Finchley Music 5th ..	61611	273	N.C.K.	7,593	6·44	489·0	350	Mature	444, 509, 471	Finchley Vasilika's Masterpiece
Finchley Nasturtium 5th ..	61613	273	29	9,044	6·45	583·1	310	Jr. 4	451, 556 ..	Werribee Lord Burnham
Finchley Nasturtium 8th ..	66462	273	N.C.K.	7,202	5·78	416·2	270	Jr. 3	357 ..	Werribee Lord Burnham
Finchley Nasturtium 9th ..	66463	273	N.C.K.	8,382	6·13	514·0	250	Sr. 2	383 ..	Finchley Masterman
Finchley Vasilika ..	39744	273	N.C.K.	8,189	6·43	526·6	350	Mature	390, 476, 403, 351	Werribee Lord Burnham
Selsey Myrtle	64222	273	N.C.K.	8,964	5·31	476·3	310	Jr. 4	321, 455 ..	Brampton Great Boy (Imp.)
Noonan, G., Benalla, Jersey (2).										
Rosemont Lady Fowler 20th	68955	273	16	5,808	5·47	317·6	290	Sr. 3	207, 268 ..	Rosemont Volunteer
Rosemont Lassie Fowler 15th	73763	273	11	5,335	6·35	339·0	310	J4. 4	232 ..	Rosemont Golden Emblem
O'Neill, J., Echuca Village, Jersey (1).										
Ullina Heather	64692	273	15½	8,012	5·78	463·2	330	Sr. 4	282, 358, 354	Ballara Fancy King
Parks, L. A., and Sons, Romsey, Guernsey (1).										
Yarraview Design ..	9770	273	17	4,808	4·74	227·9	230	Jr. 2	.. ..	Yarraview Mac
Parkes, E. F., Merton, Jersey (3).										
Irona Anthem's Melody ..	71879	273	N.C.K.	4,496	5·22	234·5	250	Sr. 2	160 ..	Kyora Anthem's Count
Irona Camelia	Vol. 28	273	N.C.K.	4,025	6·87	276·6	230	Jr. 2	.. ..	Irona Beau Vallet
Irona Petal	71882	210 (Sold)	..	3,930	4·81	189·2	250	Sr. 2	199 ..	Kyora Anthem's Count
Pattison, G., Tongala, Ayrshire (4).										
Willow Park Jeanette ..	31007	273	5	7,952	4·32	343·2	350	Mature	343, 393, 367	Fulham Beam
Willow Park Lady ..	24457	246	4½	7,209	3·85	277·4	350	Mature	290, 354, 346, 366, 358, 330	Willow Park Prince
Willow Park Marlene ..	34158	273	8½	4,880	4·69	228·8	230	Jr. 2	.. ..	Hyde Park Prelate
Willow Park Rosina ..	26810	250	4	7,920	4·01	317·4	350	Mature	278, 376, 355, 347, 324	Fulham Beam
Payne, A. E. T., Lilydale, Guernsey (4).										
Yarraview Levity ..	9781	273	17½	6,536	5·32	347·7	230	Jr. 2	.. ..	Camilla's Majestic of Maple Lodge (Imp.)
Yarraview Ruby ..	5178	273	30½	12,680	4·31	546·8	350	Mature	378, 394, 427	Camilla's Majestic of Maple Lodge (Imp.)
Yarraview Sylph ..	9790	273	23	7,641	5·50	420·0	230	Jr. 2	.. ..	Sun Rose of Maple Lodge (Imp.)
Yarraview Delight ..	5167	273	23½	8,771	4·98	437·0	350	Mature	400, 452, 455, 486	Camilla's Majestic of Maple Lodge (Imp.)

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.		Sire.
Phillips, J. H., Swan Hill, Jersey (8).											
Kantara Jessamine 2nd ..	40487	273	N.C.K.	10,817	4·76	515·4	350	Mature	331, 363, 404, 422, 413, 451, 439, 408		Glen Iris Valiant Count
Ryelands Fashionette ..	C.R.	273	N.C.K.	6,332	5·14	325·6	270	Jr. 3	..	..	Banaview Master
*Ryelands Golden Glory ..	73836	210	..	5,775	4·47	258·3	290	Sr. 3	212, 268	..	Banaview Master
Ryelands Lavona ..	73837	273	N.C.K.	9,149	5·16	472·4	250	Sr. 2	337	..	Banaview Master
Ryelands Nanette ..	64160	273	N.C.K.	8,249	5·26	434·0	350	Mature	236, 322, 350		Orphanage Zaffarine Prince
Ryelands Rosy Morn ..	73838	273	12	6,531	4·78	312·5	250	Sr. 2	253	..	Banaview Master
Ryelands Sweet Lavender	59362	273	N.C.K.	5,753	5·25	302·2	350	Mature	232, 246, 298, 338		Orphanage Zaffarine Prince
Ryelands Vanilla ..	73839	273	N.C.K.	5,327	5·67 *sold	302·2	250	Sr. 2	298	..	Banaview Master
Powell, T. S., Mansfeld, Jersey (6).											
Carellen Golden Cream ..	70637	273	14	5,433	5·80	314·9	230	Jr. 2	..	..	Glen Avon Starbright's Airshaft
Carellen Lady Madeira ..	70639	273	18½	6,554	6·22	407·5	230	Jr. 2	..	..	War Valour (Imp.)
Carellen Lady Starbright ..	65877	273	30	8,970	6·10	547·6	270	Jr. 3	419	..	Darnum Park Lord Starbright
Carellen Melody 2nd ..	Vol. 28	273	19½	5,759	5·78	333·1	230	Jr. 2	..	..	Mornmoot Magistrate
Mornmoot Clementine ..	41121	273	26	9,245	5·38	497·6	350	Mature	331, 549, 563, 566, 550, 527		Werribee Prince Madeira
Navuloa Master's Encore ..	68279	273	26	8,970	5·43	486·8	330	Sr. 4	386, 363	..	Werribee Grandmaster
Prince, Mrs. H. A., Swan Hill, Jersey (2).											
Pine Ridge Dream Girl 2nd	68644	273	20	9,987	5·71	570·5	290	Sr. 3	386, 499	..	Duke of the Lake (Imp.)
Pine Ridge Molly 4th ..	73498	273	22	9,291	6·22	577·8	270	Jr. 3	464	..	Pine Ridge Golden Duke
Raggatt, F., Tongala, Jersey (1).											
Strathbow Goldie 19th ..	64327	273	11	6,605	5·71	377·1	310	Jr. 4	368, 370	..	Grangelea Dapper
Read, Estate of the late J. D., Springhurst, Jersey (1).											
Springhurst Superlative Nardoo	69131	273	17	6,162	6·59	406·3	250	Sr. 2	313	..	Bellefaire Superlative Pride
Richardson, W. S., Bacchus Marsh, Jersey (4).											
Sutton Lea Molly ..	64397	273	11	6,519	5·49	358·1	330	Sr. 4	224, 419	..	Staghorn Prince Aldan
Sutton Lea Rose Marie ..	64399	273	12½	5,925	5·66	335·2	310	Jr. 4	..	..	Victorious Pioneer (Imp.)
Willis Vale Captor's Laburnum	64917	273	17	6,081	5·56	338·1	350	Mature	..	..	Willis Vale Camellia's Captor
Willis Vale Colonel's Pansy	64921	273	12½	5,869	5·51	323·4	330	Sr. 4	..	..	Willis Vale Mystic Colonel
Ronalds, O., Tarago, Jersey (1).											
Arlington Clementine ..	70015	273	N.C.K.	8,148	5·25	427·6	230	Jr. 2	..	..	War Valour (Imp.)
St. Joseph's Home, Ballarat, Jersey (6).											
Antrim Boronia	70002	273	16	5,915	5·43	321·3	250	Sr. 2	234	..	Marfield Joker
Belgonia Design's Perree 4th	60340	273	15	6,800	5·69	387·1	310	Jr. 4	325	..	Duke of the Lake (Imp.)
Lipook Golria	62814	273	7½	7,748	5·66	438·7	350	Mature	376	..	Lipook Golden Noble
Lipook Hazel	72458	273	19	7,182	5·74	412·2	270	Jr. 3	291	..	Marfield Joker
St. Joseph's Golden Princess	69044	273	9½	6,929	5·14	356·0	290	Sr. 3	275	..	Lipook Goldfinder
Stoneleigh Maud ..	73955	273	22	7,296	6·11	446·0	310	Jr. 4	317	..	Avonleigh Airmail
Sambell, A. K. T., Phillip Island, Dairy Shorthorn (2).											
Trenavin Park Killara ..	Vol. 2	273	N.C.K.	8,385	3·75	314·6	310	Jr. 4	320	..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Duchess 22nd	1282E	273	N.C.K.	8,634	4·12	355·3	350	Mature	325, 483	..	Willow Park Imperial 3rd
Shearman, A. and W., Darnum, Jersey (3).											
Darnum Park Molly's Attraction	C.R.	273	15	6,120	5·82	356·1	250	Sr. 2	..	..	Darnum Park Lord Starbright 2nd
Darnum Park Perfection ..	61265	273	15	5,370	6·61	355·1	350	Mature	289, 382, 376, 388		Oak Park Goldfinder
Darnum Park Starbright's Duchess	C.R.	273	10	4,428	6·42	284·1	230	Jr. 2	..	..	Darnum Park Lord Starbright 2nd
Shearn, J., Jindivick, Jersey (2).											
Carellen Dainty Maid ..	Vol. 28	273	17	7,253	5·41	392·2	230	Jr. 2	..	..	Werribee Madeira's Ace
Somerville Rosebloom 2nd	73914	273	6	4,757	5·10	242·5	290	Sr. 3	218	..	Brampton Pioneer Chut (Imp.)

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Smith Bros., Mirboo North, Jersey (9).										
Sylvan Hill Duchess 2nd ..	Vol. 28	273	N.C.K.	4,079	6·18	252·0	230	Jr. 2	.. ..	Glen Iris Bow Bells
Sylvan Hill Elizabeth ..	Vol. 28	240	N.C.K.	3,555	5·51	195·7	230	Jr. 2	.. ..	Glen Iris Bow Bells
Sylvan Hill Gaypiece ..	69186	273	N.C.K.	5,465	4·91	268·5	310	Jr. 4	266, 332 ..	Glen Iris Bow Bells
Sylvan Hill Lotus ..	55380	273	N.C.K.	5,159	4·99	257·3	350	Mature	228, 288, 239, 299, 308	Jerseyholm Handsome Boy 3rd
Sylvan Hill Meadow Queen	55381	273	N.C.K.	5,700	5·10	290·9	350	Mature	243, 348, 352, 292, 369	Jerseyholm Handsome Boy 3rd
Sylvan Hill Mercedes ..	Vol. 28	210	N.C.K.	3,255	4·80	156·4	230	Jr. 2	.. ..	Glen Iris Bow Bells
Sylvan Hill Sweet Maid ..	69192	273	N.C.K.	4,421	6·12	270·5	310	Jr. 4	241, 293 ..	Glen Iris Bow Bells
Sylvan Hill Trixie ..	74054	273	N.C.K.	5,946	5·77	343·4	270	Jr. 3	277 ..	Sylvan Hill Magnet
Sylvan Hill Vanilla ..	69194	273	N.C.K.	6,434	5·63	362·2	310	Jr. 4	226, 269 ..	Glen Iris Bow Bells
Smith, C. G., Pakenham, Jersey (2).										
Wonga Park Highland Lassie	74606	273	20	6,602	5·72	377·5	270	Jr. 3	345 ..	Wonga Park Twylish Lad
Wonga Park Songbird ..	74607	273	18½	7,857	5·56	436·8	250	Sr. 2	404 ..	Wonga Park Minx's Ace
Smith, E. L., and Son, Woodend, Friesian (10.)										
Homeleigh Allix ..	Vol. 15	240	4	8,250	2·95	243·4	310	Jr. 4	.. ..	Homeleigh Blackwell
Homeleigh Amelia ..	Vol. 15	273	9½	9,396	2·99	281·4	230	Jr. 2	.. ..	Homeleigh Blackwell
Homeleigh Claudia ..	C.R.	273	9	6,882	3·10	213·0	230	Jr. 2	.. ..	Homeleigh Blackwell
Homeleigh Jocelyn Fobes ..	5593	240	4	8,445	3·40	287·1	350	Mature	.. ..	Homeleigh Blackwell
Homeleigh Neva ..	Vol. 15	273	N.O.C.	9,750	2·93	285·5	250	Sr. 2	.. ..	Homeleigh Jardine
Homeleigh Nina ..	Vol. 15	273	N.O.C.	6,933	3·05	211·6	230	Jr. 2	.. ..	Homeleigh Jardine
Homeleigh Oakleaf ..	5598	240	4	8,340	3·08	256·9	290	Sr. 3	.. ..	Homeleigh Blackwell
Homeleigh Oresme ..	Vol. 15	273	22	9,090	3·07	279·0	250	Sr. 2	.. ..	Homeleigh Blackwell
Homeleigh Roseleaf ..	5604	240	4	9,420	3·51	330·4	310	Jr. 4	.. ..	Homeleigh Oakfield
Homeleigh Chloe ..	Vol. 15	150	.. 4	4,275	2·80	119·8	230	Jr. 2	.. ..	Homeleigh Blackwell
Smith, R. W., Swan Hill, Firesian (8).										
Wattle Bank Cremona 3rd	Vol. 15	273	25	10,502	3·63	381·5	290	Sr. 3	368 ..	Hengest Lizzie Segis
Wattle Bank Fairy ..	App. 1, Vol. 13	273	24	13,119	2·98	391·6	350	Mature	363 ..	Greenvale Woodcrest Oakwood 2nd
Ingolston Ideal Beauty 2nd	4719	273	28	16,454	3·34	549·7	350	Mature	455 ..	Greenvale Ideal Segis
Wattle Bank Mercedes Queen	6114	273	24	13,873	2·94	408·1	330	Sr. 4	329 ..	Hengest Lizzie Segis
Wattle Bank Primrose 4th ..	Vol. 15	273	28	14,667	3·10	454·7	230	Jr. 2	.. ..	Wattle Bank Segis De Kol
Wattle Bank Princess 5th ..	6121	273	14	9,969	4·00	399·0	250	Sr. 2	361 ..	Wattle Bank Segis De Kol
Wattle Bank Princess 14th	Vol. 15	273	16	8,885	3·08	274·0	230	Jr. 2	.. ..	Wattle Bank Segis De Kol
Wattle Bank Segis Jessie ..	6123	273	28	16,567	2·96	489·8	350	Mature	427 ..	Hinrest Lizzie Segis
Stephens, Dr. F. G., Vermont, Guernsey (6).										
Cleveland Peace Bell ..	8494	150	4	2,430	4·57	111·0	270	Jr. 3	289 ..	Melbourne Peter Pan
Vermont Fay	8008	273	22	6,503	4·67	303·5	270	Jr. 3	.. ..	Vermont Prince Johnnie
Vermont Henrietta ..	9561	273	11	5,639	4·85	273·7	290	Sr. 3	164 ..	Roads End Henri
Vermont Maisie	9562	273	9	3,918	5·12	200·5	230	Jr. 2	.. ..	Vermont Camilla's Sunrise
Vermont May Belle ..	5187	273	23	8,499	4·40	373·8	350	Mature	345, 367, 416	Majestic of Kings Mills
Vermont Nan	9564	210	4	3,330	4·86	162·0	230	Jr. 2	.. ..	Vermont Camilla's Sunrise
Stirling, H. V., Meade, Jersey (2).										
Coimbra Silver Queen 3rd	Vol. 28	273	16	5,395	4·64	250·4	230	Jr. 2	.. ..	Coimbra Airman
Banyule Ishta	51650	273	18½	7,871	5·37	422·3	350	Mature	347, 374, 329	Banyule Pitman
Tandberg, G., and Son, Warragul, Friesian (1).										
Bolero Sylvia Marie ..	5295	273	15	8,117	3·00	243·9	230	Jr. 2	.. ..	Pinewood Pioneer Fobes (Imp.)
Tandberg, G., and Son, Warragul, Illawarra Shorthorn (1)										
Veresdale Peach ..	28356	273	30	8,415	3·96	333·5	270	Jr. 3	.. ..	Ovensdale Pearl's Renown
Thomas and Taylor, Hamilton, Ayrshire (1)										
Jennewar Beauty ..	30709	273	15	8,229	4·58	376·6	350	Mature	290, 329, 359	Denbigh Ace
Tomasetti, B. G., Drouin West, Ayrshire (8).										
Alvaston Audrey ..	31922	273	21	7,461	4·06	302·9	290	Sr. 3	203, 284 ..	Cathcart Masterpiece
Glen Athol Merry Lass ..	C.R.	273	12	7,017	4·33	303·7	350	Mature	259, 336 ..	Glencorren Merry Lad
Glencorren Gracie ..	31415	273	25	10,832	4·47	484·5	350	Mature	309, 363, 482	Gregorland King
Glencorren Precious ..	33608	273	10	5,906	4·26	251·7	250	Sr. 2	220 ..	Scotswood Flashlight
Glencorren Valmai ..	30530	273	5	6,165	4·40	271·6	350	Mature	234, 320, 317, 302	Scotswood Michael 2nd
Glencorren Vex	32417	273	25	9,282	4·37	405·8	270	Jr. 3	384 ..	Glencorren Edison
Gorinn Merry Maid ..	33668	273	17	7,275	4·43	322·5	290	Sr. 3	273 ..	Glencorren Edison
Glencorren Quality ..	33609	240 (De-registered)	..	6,375	4·08	260·2	310	Jr. 4	222, 342 ..	Denbigh Gold King

STANDARD HERD RECORDS—*continued.*

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day lb. Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class	Previous Yields of Butter Fat.	Sire.
Trewin, J. V., Nathalia, Jersey (2).										
Belgonia Blossom 7th ..	29112	273	16	7,803	4·87	380·1	350	Mature	474, 484, 411, 437, 360	Aerial of Banyule
Weir View Golden Design 3rd	64853	273	15	7,262	5·35	388·7	270	Jr. 3	264 ..	Weir View Golden Duke
Turner, A. J., Yannathan, Jersey (1).										
The Wattles Silvermine 10th	74170	273	11	5,853	5·31	311·0	230	Jr. 2	.. ..	The Wattles Young Gamboge
Tyssen, C. J., Warragul, Jersey (5).										
Hylsbroke Air Lady 5th ..	Vol. 28	273	20	6,825	5·08	346·5	230	Jr. 2	.. ..	Banyule Mollison
Hylsbroke Joybell 3rd ..	Vol. 28	273	16	8,243	5·66	466·7	310	Jr. 4	.. ..	Latrobe Air Cloud
Hylsbroke Joybell 5th ..	71839	273	N.C.K.	6,264	5·45	341·3	270	Jr. 3	.. ..	Latrobe Dante
Hylsbroke Joy Step 5th ..	71837	273	13	6,829	5·50	375·3	290	Sr. 3	.. ..	Latrobe Starjoy
Willis Vale Captors Blossom	C.R.	273	N.C.K.	6,578	5·53	363·7	350	Mature	.. ..	Willis Vale Camelia's Captor
Vagg, E. J., Leongatha, Jersey (3).										
Bonnay Tulips Evelyn ..	65542	273	7	5,036	6·33	318·8	310	Jr. 4	331, 373 ..	Jerseyinn Edith's Masterpiece
Bonnay Tulips Judith ..	70432	240	..	4,440	5·45	241·9	270	Jr. 3	327 ..	Bonnay Edith's Masterstrain
Bonnay Winnie's Midget ..	70433	273	12	6,392	4·60	294·3	270	Jr. 3	336 ..	Bonnay Edith's Masterstrain
Van Brummelan, J. K., Notting Hill, Friesian (1).										
Bolero Venus Buttergirl ..	5297	273	22	7,721	3·52	271·9	270	Jr. 3	.. ..	Winlaton Pioneer
Vaughan Bros, Girgarre, Jersey (3).										
Lynroy Fancy 4th ..	62864	273	15	7,815	5·32	415·5	350	Mature	382, 268, 374, 465	Werribee Laverock
Lynroy Fay	67740	273	N.C.K.	7,718	5·52	426·1	310	Jr. 4	283, 443 ..	Werribee Laverock
Lynroy Vanilla 5th ..	Vol. 28	273	15	6,062	5·50	333·7	230	Jr. 2	.. ..	Werribee Laverock
Wade, W. J., Stratford, Jersey (3).										
Banyule Tiddlewinks 9th ..	34198	273	N.C.K.	8,229	5·01	412·3	350	Mature	314, 472, 448, 396, 418	Banyule Concentration
Inverbroom Ruby's Bunty	57763	273	N.C.K.	8,646	4·77	412·4	350	Mature	228, 233, 351	Grangelea Butterboy 3rd
Inverbroom Ruby's Marie ..	67091	273	N.C.K.	8,700	5·07	441·5	270	Jr. 3	508 ..	Inverbroom Marie's Majesty
Walker, C. S., Swan Hill, Jersey (22).										
Clarendon Eyre Happy Days 6th	65945	273	N.C.K.	7,493	4·46	334·2	310	Jr. 4	287, 380 ..	Clarendon Eyre Eminent's Lohengrin
Clarendon Eyre Love Lies 7th	65948	273	30	10,127	4·72	477·6	310	Jr. 4	366, 417 ..	Clarendon Eyre Ruddigore 5th
Clarendon Eyre Love Lies 9th	65950	273	N.C.K.	7,06J	5·12	361·8	290	Sr. 3	226, 338 ..	Clarendon Eyre Golden Oxford
Grangelea Rose 5th ..	48525	273	17	7,956	4·41	350·9	350	Mature	309, 366, 361, 297, 328	Banyule Macon
Grangelea Rose Marie ..	57547	273	N.C.K.	6,036	4·63	279·5	350	Mature	286, 283, 302	Grangelea Roderick
Grangelea Rose Petal 2nd	53022	273	N.C.K.	6,362	6·25	397·8	350	Mature	321, 371, 288, 454	Grangelea Cream Boy
Staghorn Cello 3rd ..	64291	273	N.C.K.	5,696	5·66	322·4	350	Mature	310, 333, 350	Staghorn Lord Aldan
Warwick Augustus Marie 6th	69625	273	N.C.K.	7,108	5·29	375·7	310	Jr. 4	276, 352 ..	Warwick Golden Lord
Warwick Augustus Marie 8th	C.R.	273	N.C.K.	4,910	4·68	230·0	230	Jr. 2	.. ..	Warwick Golden Lord
Warwick Augustus Marie 9th	Vol. 28	273	21	6,713	4·56	306·4	230	Jr. 2	.. ..	Leven Brae Ado Masterpiece
Warwick Beauty 6th ..	64825	273	N.C.K.	7,199	4·78	343·9	330	Sr. 4	225, 306, 399	Warwick Golden Lord
Warwick Beauty 10th ..	Vol. 28	273	N.C.K.	6,521	5·27	343·6	230	Jr. 2	.. ..	Leven Brae Ado Masterpiece
Warwick Bellbird 6th ..	Vol. 28	273	N.C.K.	4,863	5·26	255·8	230	Jr. 2	.. ..	Leven Brae Ado Masterpiece
Warwick Cello 2nd ..	Vol. 28	273	22	6,113	5·55	339·3	230	Jr. 2	.. ..	Leven Brae Ado Masterpiece
Warwick Cream Stockings 3rd	69628	273	22	8,199	5·18	424·6	310	Jr. 4	314, 411 ..	Warwick Golden Lord
Warwick Cream Stockings 5th	C.R.	273	19	6,822	4·65	317·4	270	Jr. 3	309 ..	Warwick Golden Lord
Warwick Design's Finesse	Vol. 28	273	N.C.K.	6,719	5·51	370·3	230	Jr. 2	.. ..	Leven Brae Ado Masterpiece
Warwick Polly 2nd ..	46642	273	N.C.K.	8,970	4·89	438·3	350	Mature	227, 324, 324, 454, 439, 452	Preston Star King
Warwick Polly 4th ..	59945	273	N.C.K.	8,431	4·80	404·9	350	Mature	265, 329, 372, 338	Glen Iris Golden Lord
Warwick Polly 6th ..	C.R.	273	N.C.K.	8,547	5·41	462·3	350	Mature	336, 466 ..	Glen Iris Golden Lord
Warwick Princess 12th ..	Vol. 28	273	N.C.K.	6,213	4·83	299·9	250	Sr. 2	.. ..	Warwick Golden Lord
Weir View Golden Design 2nd	59968	273	19	7,601	4·87	370·4	330	Sr. 4	324, 477, 473	Weir View Golden Duke

STANDARD HERD RECORDS—*continued.*

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Waterhouse, H. W., and Son, Pakenham, Jersey (4).										
Navuloa Grandmaster's Magnet	58682	273	14	8,673	5·63	488·0	350	Mature	532 ..	Werribee Grandmaster
Navuloa La Stralia ..	68277	273	15	8,345	5·36	447·6	270	Jr. 3	380 ..	Staghorn Laburnum's Masterpiece
Navuloa Master's Magnet	49805	273	15	9,564	4·87	465·5	350	Mature	515 ..	Werribee Grandmaster
Navuloa Master's Stralia ..	49808	273	16	8,619	5·22	449·5	350	Mature	454 ..	Werribee Grandmaster
Watson, K. E, Gembrook, Jersey (5).										
Arranmore Golden Dream	C.R.	180	..	3,165	6·10	193·0	250	Sr. 2	178 ..	Glen Iris Golden Dreamer
Goronga Farm Fancy Modiste	C.R.	273	6	5,709	6·13	349·8	310	Jr. 4	303 ..	Werribee Alanda
Goronga Farm Larkspur's Aerofoil	61923	240	..	6,735	5·37	361·9	350	Mature	253 ..	Werribee Alanda
Goronga Farm Madeira's Modesty	57522	273	12	7,197	5·95	427·9	350	Mature	265, 292, 274, 265	Werribee Prince Madiera
Goronga Farm Star Turn..	61928	210	..	6,112	5·61	342·7	350	Mature	303, 230, 262	Somerville Reputed King
Whelpton, B. W., Whittlesea, Jersey (5).										
Boorene Little Connie ..	51897	273	18	9,426	4·71	444·0	350	Mature	.. ..	Elderslie Lord Concentration
Crystal Brook Bloom ..	47798	273	18	8,465	5·74	485·5	350	Mature	.. ..	Crystal Brook Noble
Hemswell Prude	Vol. 28	273	13	6,791	4·91	333·3	230	Jr. 2	.. ..	Clarendon Eyre Eminent's Moon 2nd
Jubilee Erythrina ..	67235	273	21	6,264	5·95	372·8	310	Jr. 4	.. ..	Werribee Stylish Masterpiece
Willis Vale Colonel's Princess	74548	273	12	5,922	5·63	333·4	310	Jr. 4	.. ..	Willis Vale Mystic Colonel
Whitehead, E. J., and Sons, Beaconsfield, Jersey (1).										
Selsey Royal Girl ..	Vol. 28	273	6	3,867	5·51	212·9	230	Jr. 2	.. ..	Selsey Right Royal
Williams, F. A. and L., Bamawm Extension, Jersey (6).										
Bamawm Daisy Grey ..	65321	273	23	9,219	5·60	516·6	290	Sr. 3	248, 376 ..	Bamawm Leon
Bamawm Fancy Garenne 2nd	Vol. 28	273	21	8,178	5·80	474·6	270	Jr. 3	.. ..	Bamawm Bonnie Boy
Bamawm Fancy Madeira ..	Vol. 28	273	13½	5,732	6·15	352·4	230	Jr. 2	.. ..	Bamawm Bonnie Boy
Bamawm Mistress Peggy ..	56238	273	26	9,218	5·63	518·9	350	Mature	373, 422, 344, 507	Bamawm Bonnie Boy
Bamawm Princess Pamela	47103	240 (Died)	..	7,785	5·37	417·9	350	Mature	386, 404, 415, 403, 250, 537	Bamawm Leon
Bamawm Ruth	60474	273	24½	10,278	5·20	534·9	350	Mature	402, 492, 526	Bamawm Leon

Prosecutions.

On the 30th October, J. M. Storey, of Emu Creek, was convicted at Bendigo Court of Petty Sessions by Mr. Williams, P.M., and fined £5 on each of two charges, with £4 17s. 5d. costs. The offences were for being the owner of an unlicensed dairy farm, and for selling milk without a licence. Mr. Anderson, of the Crown Solicitor's Office, conducted the case for the Crown.

On 31st October, in the Richmond Court of Petty Sessions, Frederick Morse, of Swan-street, Burnley, was fined £10, with 10s. costs, for selling milk from an unlicensed dairy.

In October three cases were taken under section 10 of the Sheep Dipping Act. Evidence was given in each case that sheep carrying ticks or lice were found by an Inspector in a saleyard. Fines amounting to £6 10s., with £3 7s. 5d. costs, were imposed. The cases were heard at Bairnsdale, Mirboo North, and Warragul.

In the Heyfield–Maffra district, 49 convictions under the Cattle Compensation Act and seventeen under the Swine Act were recorded against cattle and swine owners for not giving or transmitting by registered post the necessary stamped statement to the purchaser within seven days after the sale of cattle or swine. Fines amounting to £48 15s. were imposed by Mr. Burke, P.M., and costs amounting to £5 15s. 11d. were awarded.

Tubercle Free Herds

The following herds have been declared free of tuberculosis under the scheme conducted by the Department of Agriculture. Under this scheme a tuberculosis-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests, or upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

ACCREDITED TUBERCLE FREE HERDS.

Name.	Address.	Number in Herd.	Name.	Address.	Number in Herd.
Ballarat Mental Hosp...	Ballarat	78	Onley, W. H. ..	"Glenholme," Caldermeade	64
Banyule Stud Pty. Ltd.	Heidelberg	38			
Dennis, Mrs. A. A. ..	Frankston	33	Payne, A. E. T. ..	"Yarra View," Lilydale	77
Dookie Agricultural College	Dookie	78			
Dunbar and Clark, Messrs.	"Hazeldean Dairy," Mount Dandenong	15	Payne, T. E. N. ..	"Woodburn," Kilmore	58
Geelong Grammar School	Corio	58	Powell, T. S. ..	"Carellon," Mansfield	45
Gorman, A. W. ..	"Cathcart," Alexandra	61	Richardson Bros., Messrs.	"Faldinghurst," Upper Beaconsfield ..	30
Henderson, J. L. and E. I.	Wangaratta ..	95	Samuel, B. T. ..	Lang Lang ..	60
			School of Horticulture..	Burnley	8
Holloway, R. W. ..	Caldermeade ..	56	State Experiment Farm	Rutherglen ..	51
Lawrence, F. H. ..	"Rainga," Tarrawarra	60	State Research Farm ..	Werribee	211
Longerenong Agricultural College	Dooen	47	Wells, W. G. ..	Caldermeade ..	62

In addition to the above-mentioned herds there are 130 commercial dairy herds containing 4,612 head of cattle which may be considered free of tuberculosis. All these herds have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds, they cannot be considered as accredited under the accreditation scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

There are also 102 herds in which 5,075 head of cattle have passed one test, and may be considered, therefore to be in process of becoming tuberculosis-free herds.

UNAUTHORIZED INTRODUCTION OF ANIMALS AND BIRDS

Danger to Live Stock Industry

At a recent conference of Commonwealth and State Veterinary Officers, consideration was given to the danger of introducing serious animal diseases into the Commonwealth by the indiscriminate and illegal introduction into Australia of animals and birds from foreign countries.

At the present time this danger has become accentuated on account of the number of soldiers, sailors, and airmen who are returning to Australia from foreign countries. It is possible that these men, acting in ignorance, may endeavour to land birds and animals which, under the Quarantine Regulations, are not permitted to be introduced.

Australia is fortunate in that our live stock are free of most of the serious animal and poultry diseases, but many of these are present in countries a short distance from the Commonwealth, and their introduction can be prevented only by a rigid adherence to the regulations of the Quarantine Act.

The introduction of dogs from foreign countries could very easily result in the introduction of rabies, which would be in the nature of a national disaster, and for this reason the regulations provide that dogs may be introduced only from the United Kingdom and New Zealand.

Registered Fertilizers

Analyses and Unit Values

Fertilizers Act 1928 (No. 3680).

UNIT VALUES FOR THE YEAR 1941.

	£	*s.*	*d.*
Nitrogen, organic, as Blood; Blood and Bone; Blood, Bone, and Flesh; and Fine Bone ..	0	19	11
„ as Coarse Bone and in Bone Fertilizers	0	18	6
„ as Nitrate	0	19	2
„ as Ammonia	0	16	2
Phosphoric Acid—			
as Water Soluble	0	4	8
as Citrate Soluble—			
in Blood and Bone and Animal Fertilizers and in Mixed and Complete Fertilizers containing either or both of the foregoing	0	4	6
in all other Fertilizers	0	4	0
as Citrate Insoluble—			
in Blood and Bone and Animal Fertilizers, and in Mixed and Complete Fertilizers containing either or both of the foregoing	0	3	6
in other Mixed Fertilizers and in Ground Phosphate	0	2	10
in other Fertilizers	0	1	0
as Fine Bone	0	4	10
as Coarse Bone	0	4	4
Potash—			
as Sulphate	0	8	0
as Chloride	0	6	11

Melbourne, 2nd December, 1940.

W. R. JEWELL, M.Sc., F.I.C.,
Chemist for Agriculture.

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1941.

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash as Sulphate.	Price asked per ton.*			Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone.	As Blood, Bone, and Flesh.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.					
Nitrogenous—Readily Available.		%	%	%	%	%	%	%	%	%	%	%	£	*s.*	*d.*	
Nitrate of Soda	Sickle in diamond	15·50	..	..	..	..	15·50	..	..	..	..	..	15	0	0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
„ „	Cresco ..	15·50	..	..	..	..	15·50	..	..	..	..	..	15	0	0	Cresco Fertilizers Ltd., Geelong
„ „	Pivot ..	15·50	..	..	..	..	15·50	..	..	..	..	..	15	0	0	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
„ „	Champion ..	16·00	..	..	..	..	16·00	..	..	..	..	..	15	0	0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
Sulphate of Ammonia	M.G. Co. in diamond	..	20·59	..	..	..	20·59	..	..	..	..	..	16	12	6	The Metropolitan Gas Co., 196 Flinders-st., Melbourne
„ „	Pivot	..	20·60	..	..	..	20·60	..	..	..	..	..	16	12	6	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
„ „	Sickle in diamond	..	20·60	..	..	..	20·60	..	..	..	..	..	16	12	6	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
„ „	Cresco ..	..	20·60	..	..	..	20·60	..	..	..	..	..	16	12	6	Cresco Fertilizers Ltd., Geelong

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1923 (No. 3680) FOR THE YEAR 1941—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash as Sulphate.	Price asked per ton.*	Where Obtainable
		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone.	As Blood, Bone, and Flesh.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
		%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
Moderately Available.														
Dried Blood ..	Fitzroy ..	..	..	13·00	..	..	13·00	..	..	..	..	..	12 10 0	W. Angliss and Co. (Aust.) Pty. Ltd., 42 Bourke-st., Melbourne
„ „ ..	T.B. & S. in diamond—Brooklyn	..	..	12·00	..	..	12·00	..	..	..	..	..	12 10 0	Thos. Borthwick and Sons (A/asia) Ltd., 84 William-st., Melbourne
„ „ ..	M.C.C. in diamond	..	..	12·00	..	..	12·00	..	..	..	..	..	10 0 0	Melbourne City Council, Town Hall, Melbourne
„ „ ..	Pannifex's ..	..	..	12·00	..	..	12·00	..	..	..	..	..	12 10 0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
„ „ ..	Pannifex's Blood Flour	..	..	13·00	..	..	13·00	..	..	..	..	..	12 10 0	
„ „ ..	T.B. & S. in diamond—Portland	..	..	12·00	..	..	12·00	..	..	..	..	..	12 10 0	Thomas Borthwick and Sons (Aust/asia) Ltd., 84 William-street, Melbourne
Blood Manure ..	Nifex ..	..	..	7·50	..	..	7·50	..	..	..	..	..	8 10 0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
„ „ ..	Pentagon ..	..	..	8·13	..	..	8·13	..	2·07	1·13	3·20	..	8 15 0	Mulgrave By-Products Co., North-road, East Oakleigh
Slowly Available.														
Castor Meal ..	Alba ..	..	..	..	..	..	5·00 (as castor meal)	..	..	2·25	2·25	·75	4 10 0	Lycett Proprietary Ltd., Normanby-road, Montague
„ „ ..	Pannifex's ..	..	..	..	..	..	4·50 (as castor meal)	..	..	2·25	2·25	·75	4 5 0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
„ „ ..	L.F.X. ..	..	..	..	..	..	5·00 (as castor meal)	..	..	2·25	2·25	·75	4 5 0	Lawford's Fruit Exchange Pty. Ltd., Doncaster

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash as Sulphate.	Price asked per ton.*	Where Obtainable.
		As Nitrate.	As Ammonia.	As Flesh, Hoof, and Treated Leather.	As Blood and Bone.	As Blood, Bone, and Flesh.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
		%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
Nitrogenous—Slowly Available—continued.														
Rape Seed Meal	Alba ..	..	..	..	..	..	5·50 (as rape seed meal)	..	..	1·75	1·75	1·50	5 5 0	Lycett Proprietary Ltd., Normanby-road, Montague
Wool Waste ..	A.L.T. ..	..	..	..	..	..	3·85 (as wool)	..	..	·70	·70	·31	3 0 0	A. L. Thompson Pty. Ltd., 49 Grant-st., South Melbourne
Flesh, Hoof, and Treated Leather	Pennell's Nitrogenous	..	..	8·00	..	..	8·00	..	..	..	..	..	8 0 0	Est. G. W. Pennell, Burke-st., Braybrook
„ „	No. 3 Fertillo	..	..	8·00	..	..	8·00	..	..	..	..	..	8 0 0	Glues and By-Products Pty. Ltd., Melbourne
„ „	Pannifex's ..	..	..	8·00	..	..	8·00	..	..	..	..	..	8 0 0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1941—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash as Sulphate.	Price asked per ton.*	Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone.	As Blood, Bone, and Flesh.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
		%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
Phosphatic—Readily Available.														
Superphosphate 22 per cent.	Cresco ..	..	..	..	..	..	..	20·50	·50	1·00	22·00	..	4 19 0	Cresco Fertilizers Ltd., Geelong
" "	Sickle in diamond	..	..	..	..	..	..	20·50	·50	1·00	22·00	..	4 19 0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
" "	Pivot ..	..	..	..	..	..	..	20·50	·50	1·00	22·00	..	4 19 0	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
" "	Lamaco ..	..	..	..	..	..	..	20·50	·50	1·00	22·00	..	4 19 0	New Zealand Loan and Mercantile Agency Co. Ltd., 538 Collins-st., Melbourne
" "	Cockbill's ..	..	..	..	..	..	..	20·50	·50	1·00	22·00	..	4 19 0	W. and J. Cockbill (trading as J. Cockbill), Footscray-rd., Footscray
Phosphate—Moderately Available.														
Basic Phosphate	Sickle in diamond	..	..	..	..	..	..	..	15·50	3·20	18·70	..	5 16 6	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
" "	Pivot ..	..	..	..	..	..	..	..	15·50	3·00	18·50	..	5 16 6	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
Super. and Rock Phosphate	Pivot ..	..	..	..	..	..	..	10·00	·50	18·50	29·00	..	5 9 0	" " "
" "	Cresco 50·50 Phosphate	..	..	..	..	..	..	9·16	1·84	17·10	28·40	..	5 9 0	Cresco Fertilizers Ltd., Geelong
" "	Sickle in diamond	..	..	..	..	..	..	10·00	·50	18·50	29·00	..	5 9 0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
Slowly Available.		..												
Ground Phosphate	Sickle in diamond (80%)	..	..	..	..	..	..	..	..	36·65	36·65	..	5 4 6	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
" "	Pivot (very fine)	..	..	..	..	..	..	..	..	36·50	36·50	..	5 4 6	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
Potassic—Readily Available.														
Sulphate of Potash	Cresco ..	..	..	..	..	..	..	..	..	..	..	48·50	19 7 6	Cresco Fertilizers Ltd., Geelong
" "	Pivot ..	..	..	..	..	..	..	..	..	..	..	48·50	19 7 6	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
" "	Sickle in diamond (90%)	..	..	..	..	..	..	..	..	..	..	48·50	19 7 6	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
" "	Pannifex's ..	..	..	..	..	..	..	..	..	..	..	48·50	19 7 6	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
Muriate of Potash	Sickle in diamond (80%)	..	..	..	..	..	..	..	..	..	..	50·00 (as chloride)	17 7 6	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
" "	Cresco ..	..	..	..	..	..	..	..	..	..	..	50·00 (as chloride)	17 7 6	Cresco Fertilizers Ltd., Geelong
" "	Pannifex's ..	..	..	..	..	..	..	..	..	..	..	50·00 (as chloride)	17 7 6	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
" "	Pivot ..	..	..	..	..	..	..	..	..	..	..	50·00 (as chloride)	17 7 6	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3630) FOR THE YEAR 1941—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash as Sulphate.	Price asked per ton.*	Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone.	As Blood, Bone, and Flesh.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
		%	%	%	%	%	%	%	%	%	%	%	£. s. d.	
Containing Nitrogen and Phosphoric Acid—Readily Available.														
Super. and Ammonia	Cresco (1 and 1)	..	10·30	..	..	..	10·30	10·25	·25	·50	11·00	..	11 10 0	Cresco Fertilizers Ltd., Geelong
„ „	Cresco (2 and 1)	..	6·87	..	..	..	6·87	13·66	·34	·66	14·66	..	9 11 6	„ „ „
„ „	Cresco (3 and 1)	..	5·00	..	..	..	5·00	15·40	·30	·80	16·50	..	8 11 0	„ „ „
„ „	Cresco (6 and 1)	..	2·85	..	..	..	2·85	17·48	·42	·85	18·75	..	7 6 0	„ „ „
„ „	Pivot III.	..	10·00	..	..	..	10·00	10·20	·20	·50	10·90	..	11 10 0	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
„ „	Pivot II. (A)	..	6·80	..	..	..	6·80	13·60	·30	·60	14·50	..	9 11 6	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
„ „	Pivot II.	..	5·00	..	..	..	5·00	15·30	·30	·80	16·40	..	8 11 0	„ „ „
„ „	Pivot I.	..	2·90	..	..	..	2·90	17·40	·40	·80	18·60	..	7 6 0	„ „ „
„ „	Sickle in diamond (1 and 1)	..	10·30	..	..	..	10·30	10·25	·25	·50	11·00	..	11 10 0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
„ „	Sickle in diamond (2 and 1)	..	6·87	..	..	..	6·87	13·66	·34	·66	14·66	..	9 11 6	„ „ „
„ „	Sickle in diamond (3 and 1)	..	5·00	..	..	..	5·00	15·40	·30	·80	16·50	..	8 11 0	„ „ „
„ „	Sickle in diamond (6 and 1)	..	2·90	..	..	..	2·90	17·50	·40	·90	18·80	..	7 6 0	„ „ „
„ „	Pannifex (1 & 1)	..	10·30	..	..	..	10·30	10·25	·25	·50	11·00	..	11 10 0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
„ „	Pannifex (2 & 1)	..	6·87	..	..	..	6·87	13·66	·34	·66	14·66	..	9 11 6	„ „ „
„ „	Pannifex (3 & 1)	..	5·00	..	..	..	5·00	15·40	·30	·80	16·50	..	8 11 0	„ „ „
„ „	Pannifex (6 & 1)	..	2·90	..	..	..	2·90	17·50	·40	·90	18·80	..	7 6 0	„ „ „
Nitro Superphosphate	Sickle in diamond	..	1·50	..	..	0·50	2·00	16·70	1·10	2·00	19·80	..	7 6 6	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
„ „	Cresco	..	..	1·50	..	·50	..	2·00	16·39	1·10	1·70	19·19	..	7 6 6	Cresco Fertilizers Ltd., Geelong
Moderately Available.														
Ammonia and Phosphate	Cresco	..	..	2·00	..	..	..	2·00	8·30	1·60	15·70	25·60	..	6 18 0	„ „ „
„ „	Sickle in diamond	..	..	2·00	..	..	..	2·00	8·20	·20	18·90	27·30	..	6 18 0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
Blood, Bone, and Super.	Sickle in diamond	..	..	..	..	2·50	2·50	12·51	1·43	2·96	16·90	..	7 11 0	„ „ „
„ „	Cockbill's	..	..	..	2·50	..	2·50	10·51	1·43	4·96	16·90	..	8 7 6	W. and J. Cockbill (trading as J. Cockbill), Footscray-rd., Footscray
„ „	Pannifex's	..	..	..	..	2·50	2·50	10·25	3·25	4·00	17·50	..	7 11 0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
Bone and Super.	Sickle in diamond, No. 1	..	..	..	..	2·00	2·00	11·40	3·00	5·30	19·70	..	7 11 0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
„ „	Cresco No. 1	..	..	..	2·00	..	2·00	9·50	3·90	3·00	16·40	..	7 11 0	Cresco Fertilizers Ltd., Geelong
„ „	Pannifex's	..	..	..	..	1·75	1·75	10·25	4·25	5·50	20·00	..	7 11 0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
Super. and Bone	Cresco No. 2	..	..	..	..	1·00	1·00	16·10	1·10	3·60	20·80	..	6 19 0	Cresco Fertilizers Ltd., Geelong
„ „	Sickle in diamond, No. 2	..	..	..	..	1·00	1·00	17·00	1·40	1·90	20·30	..	6 19 0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
„ „	Pannifex's	..	..	..	..	·90	·90	15·25	2·25	3·50	21·00	..	6 19 0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
Mixed Fertilizer	Pennell's	..	..	..	..	5·50 (as bone meat and skin)	5·50	1·00	3·50	7·50	12·00	..	8 0 0	G. W. Pennell, Braybrook

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1941—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash as Sulphate.	Price asked per ton.*	Where Obtainable.
		As Flesh, Hoof, and Treated Leather.	As Ammonia.	As Blood.	As Blood and Bone.	As Blood, Bone, and Flesh.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
		%	%	%	%	%	%	%	%	%	%	%	£ d. d.	
Containing Nitrogen and Phosphoric Acid—Moderately Available—continued.														
Mixed Fertilizer	Fertillo No. 1	5·00	..	..	..	..	5·00	2·00	3·00	7·00	12·00	..	7 15 0	Glues and By-Products Pty. Ltd., Melbourne
„ „	Fertillo No. 2	5·75	..	..	..	..	5·75	2·00	2·00	6·00	10·00	..	8 0 0	„ „ „
„ „	Pannifex	5·00	..	..	..	..	5·00	1·00	5·00	6·00	12·00	..	8 10 0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
Blood, Bone, and Treated Leather Fertilizer	Pannifex's ..	2·50 (as treated leather meal)	..	..	..	2·50	5·00	2·00	3·00	5·00	10·00	..	8 0 0	„ „ „
Blood and Bone	Sickle in diamond	..	..	..	..	5·00	5·00	..	5·00	9·00	14·00	..	8 0 0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
„ „	Sickle in diamond (No. 2)	..	..	..	..	7·25	7·25	..	6·00	7·00	13·00	..	9 10 0	„ „ „
„ „	J. A. Dundas'	..	..	..	..	4·50	4·50	..	7·14	13·61	20·75	..	8 10 0	J. A. Dundas, Dynon-rd., Footscray
„ „	Corio ..	..	..	..	4·00	..	4·00	..	6·00	8·00	14·00	..	7 0 0	The Corio Trading Co. Pty. Ltd., 164 Moorabool-street, Geelong
„ „	Cockbill's ..	..	..	..	..	5·25	5·25	..	2·00	8·00	10·00	..	9 10 0	W. and J. Cockbill (trading as J. Cockbill), Footscray-rd., Footscray
„ „	Fitzroy in diamond ..	..	..	..	5·50	..	5·50	..	8·00	8·00	16·00	..	7 15 0	W. Angliss and Co. (Aust.) Pty. Ltd., 42 Bourke-st., Melbourne
„ „	W. & M. in circle	..	..	..	5·00	..	5·00	..	4·50	7·50	12·00	..	7 10 0	Western and Murray Co-operative Bacon and Meat Packing Co. Ltd., 522 Flinders-lane, Melbourne
„ „	Pridham's ..	..	..	..	5·10	..	5·10	..	6·00	8·00	14·00	..	8 0 0	W. Pridham Pty. Ltd., Evans-st., Braybrook
„ „	Ibis	..	..	..	..	5·50	5·50	..	7·00	7·00	14·00	..	7 10 0	Ficken, Halliday and McClelland Pty. Ltd., 634 Bourke-st., Melbourne
„ „	P.M. ..	..	..	..	..	7·00	7·00	..	6·31	5·69	12·00	..	9 0 0	J. Kitchen and Sons Pty. Ltd., Ingles-st., Port Melbourne
„ „	Solo ..	..	..	..	..	7·00	7·00	..	4·25	10·75	15·00	..	9 0 0	„ „ „
„ „	Cockatoo ..	..	..	..	4·56	..	4·56	..	5·90	5·88	11·78	..	6 10 0	R. Fordham, Cressy-rd., Camperdown
„ „	Echuca ..	..	..	..	4·55	..	4·55	..	5·49	9·43	14·92	..	7 10 0	Echuca Freezing Works Goulburn-rd., Echuca East
„ „	Champion ..	..	..	..	6·00	..	6·00	..	6·00	6·00	12·00	..	8 10 0	Sims Cooper (Freezing Works) Pty. Ltd., Henty House, 490 Little Collins-street, Melbourne
„ „	Fitzgerald's ..	..	..	..	5·00	..	5·00	..	5·25	9·75	15·00	..	7 10 0	P. Fitzgerald and Sons, Oakleigh
„ „	T.B. and S. in diamond (Portland)	..	..	..	5·75	..	5·75	..	5·75	6·00	11·75	..	8 0 0	Thos. Borthwick and Sons (A'asia) Ltd., 84 William-st., Melbourne
„ „	T.B. and S. in diamond No. 1 (Brooklyn)	..	..	..	5·75	..	5·75	..	5·75	6·00	11·75	..	8 0 0	„ „ „
„ „	Apex ..	..	..	..	..	5·00	5·00	..	3·00	12·00	15·00	..	8 0 0	North-Eastern Bone Products, Wangaratta

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1941—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash as Sulphate.	Price asked per ton.*			Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone.	As Blood, Bone, and Flesh.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.		£	s.	d.	
		%	%	%	%	%	%	%	%	%	%	%				
Containing Nitrogen and Phosphoric Acid—Moderately Available—continued.																
Blood and Bone	Pannifex's No. 1	..	..	..	..	5·50	5·50	..	6·00	8·00	14·00	..	8	5	0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
,, ,,	Pannifex's No. 2	..	..	..	..	7·00	7·00	..	5·00	6·00	11·00	..	9	0	0	,, ,, ,,
,, ,,	Pannifex's No. 3	..	..	..	..	5·50	5·50	..	5·00	10·00	15·00	..	8	5	0	,, ,, ,,
,, ,,	Pannifex's No. 4	..	..	..	..	6·00	6·00	..	5·00	7·00	12·00	..	8	5	0	,, ,, ,,
,, ,,	Pannifex's No. 5	..	..	..	..	8·00	8·00	..	3·00	5·00	8·00	..	9	0	0	,, ,, ,,
,, ,,	Pannifex's No. 6	..	..	..	..	6·00	6·00	..	6·00	10·00	16·00	..	8	10	0	,, ,, ,,
,, ,,	Pannifex's No. 7	..	..	..	..	4·00	4·00	..	7·00	9·00	16·00	..	8	5	0	,, ,, ,,
,, ,,	Pannifex's No. 8	..	..	..	..	4·50	4·50	..	6·00	10·00	16·00	..	8	5	0	,, ,, ,,
,, ,,	Pannifex's No. 9	..	..	..	..	7·00	7·00	..	4·00	5·00	9·00	..	9	0	0	,, ,, ,,
,, ,,	Pannifex's No. 10	..	..	..	..	7·00	7·00	..	6·31	5·69	12·00	..	9	0	0	,, ,, ,,
,, ,,	Pannifex's No. 11	..	..	..	5·00	..	5·00	..	4·00	6·00	10·00	..	8	5	0	,, ,, ,,
,, ,,	Pannifex's No. 14	..	..	..	..	5·00	5·00	..	6·00	8·00	14·00	..	8	5	0	,, ,, ,,
,, ,,	Pannifex's No. 15	..	..	..	..	7·00	7·00	..	6·00	8·00	14·00	..	9	0	0	,, ,, ,,
,, ,,	Cresco ..	..	..	..	..	7·00	7·00	..	6·50	7·50	14·00	..	9	10	0	Cresco Fertilizers Ltd., Geelong
,, ,,	Bendigonian in circle	..	..	..	4·50	..	4·50	..	5·59	10·00	15·59	..	8	0	0	Bendigo Fertilizer and Wool Co. Pty. Ltd., Charing Cross, Bendigo
,, ,,	Sayer ..	..	..	..	3·57	..	3·57	..	8·58	10·31	18·89	..	8	0	0	Sayer Co. (Aust.) Pty. Ltd., Laverton
,, ,,	Valley ..	..	..	..	..	5·09	5·09	..	3·44	4·23	7·67	..	6	10	0	Goulburn Valley Freezing Works, Shepparton
,, ,,	M.S.C. ..	..	..	..	6·00	..	6·00	..	4·25	6·25	10·50	..	8	12	7	Mildura Shire Council, Mildura
,, ,,	Arch No. 1 ..	..	..	..	7·00	..	7·00	..	4·00	5·00	9·00	..	8	0	0	Amalgamated Freezing Co. (Vic.) Pty. Ltd., 54 Market-st., Melbourne
Animal Fertilizer	Fitzgerald's ..	..	..	..	..	3·70	3·70	..	5·75	13·25	19·00	..	7	10	0	P. Fitzgerald and Sons, Warrigal-rd., Oakleigh
,, ,,	A.N.A. Surprise	..	..	..	..	5·00	5·00	..	4·00	10·00	14·00	..	8	10	0	G. W. Pennell, Burke-st., Braybrook
Bone Fertilizer	Newnham's ..	..	..	..	..	..	2·28 (as bone)	..	6·86	16·72	23·58	..	5	10	0	Newnham Pty. Ltd., Box 8, P.O., Sale
Containing Phosphoric Acid and Potash—Readily Available.																
Super. and Potash	Sickle in diamond (S.P. Super. Potash)	..	..	..	..	..	..	15·40	·30	·80	16·50	12·50 (as muriate)	8	14	6	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
,, ,,	Pivot IX. ..	..	..	..	..	..	..	15·40	·30	·80	16·50	12·50 (as muriate)	8	14	6	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
,, ,,	Pannifex's ..	..	..	..	..	..	..	15·40	·30	·80	16·50	12·50 (as muriate)	8	14	6	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne, C.1
,, ,,	Cresco (3 and 1)	..	..	..	..	..	..	15·38	·37	·75	16·50	12·5 (as muriate)	8	14	6	Cresco Fertilizers Ltd., Geelong
Containing Nitrogen, Phosphoric Acid and Potash																
Complete Manure	Sickle, No. 1 ..	..	1·00	..	..	1·40	2·40	12·50	1·70	2·10	16·30	5·00 (unspecified)	8	19	6	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1941—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash as Sulphate.	Price asked per ton.*			Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone.	As Blood, Bone, and Flesh.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.		£	s.	d.	
Containing Nitrogen, Phosphoric Acid, and Potash—continued		%	%	%	%	%	%	%	%	%	%	%				
Complete Manure	Sickle in diamond, No. 2	..	1·00	..	..	1·00	2·00	14·40	1·30	1·60	17·30	4·20 (unspecified)	8	15	6	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
,, ,,	Sickle in diamond (Market Garden)	..	1·70	..	..	1·50	3·20	12·40	2·00	2·70	17·10	2·42 (unspecified)	9	5	0	,, ,, ,,
,, ,,	Sickle in diamond (A) (5.1.1.)	..	2·90	..	..	..	2·90	14·60	·40	·70	15·70	6·90 (unspecified)	9	7	6	,, ,, ,,
,, ,,	Sickle in diamond (B) (5.2.1.)	..	5·00	..	..	..	5·00	12·80	·30	·60	13·70	6·00 (unspecified)	10	11	6	,, ,, ,,
,, ,,	Sickle in diamond (C) (4.4.1.)	..	9·15	..	..	..	9·15	9·11	·22	·44	9·77	5·39 (unspecified)	12	11	6	,, ,, ,,
,, ,,	Pivot IV. ..	..	2·90	..	..	..	2·90	14·30	·30	·70	15·30	6·90	9	7	6	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
,, ,,	Pivot VI. ..	..	9·10	..	..	..	9·10	9·10	·20	·40	9·70	5·30	12	11	6	,, ,, ,,
,, ,,	Cresco No. 1 ..	..	1·00	..	1·40	..	2·40	11·25	2·00	4·50	17·75	5·00 (unspecified)	8	19	6	Cresco Fertilizers Ltd., Geelong
,, ,,	Cresco (Market Garden)	..	1·50	..	1·56	..	3·06	11·65	1·49	3·26	16·40	2·42 (unspecified)	9	5	0	,, ,, ,,
,, ,,	Cresco, No. 2 ..	..	9·15	..	..	..	9·15	9·11	·22	·44	9·77	5·39 (unspecified)	12	12	0	,, ,, ,,
,, ,,	Cresco, No. 3 ..	..	5·15	..	..	..	5·15	12·81	·31	·63	13·75	6·06 (unspecified)	10	11	6	,, ,, ,,
,, ,,	Cresco, No. 4 ..	..	8·24	..	..	..	8·24	8·20	·20	·40	8·80	10·00 (as muriate)	13	5	0	,, ,, ,,
,, ,,	Pannifex's No. 1	..	1·00	..	..	1·40	2·40	12·50	1·70	2·10	16·30	5·00 (as muriate)	8	19	6	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
,, ,,	Pannifex's No. 2	..	1·00	..	..	1·00	2·00	14·80	·40	·70	15·90	5·00 (as muriate)	8	15	6	,, ,, ,,
,,	Pannifex's No. 3	..	2·90	..	..	..	2·00	14·60	·40	·70	15·70	7·00 (as muriate)	9	7	6	,, ,, ,,
,, ,,	Pannifex's No. 4	..	5·00	..	..	..	5·00	12·80	·30	·60	13·70	6·00 (as muriate)	10	11	6	,, ,, ,,
,, ,,	Pannifex's No. 5	..	9·10	..	..	..	9·10	9·10	·20	·40	9·70	5·50 (as muriate)	12	11	6	,, ,, ,,
,, ,,	Pannifex's (Market Garden)	..	1·70	..	..	1·50	3·20	11·50	2·50	3·00	17·00	2·40 (as muriate)	9	5	0	,, ,, ,,

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1941—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.	Phosphoric Acid.	Mechanical Condition.		Price asked per ton.*	Where Obtainable.
				Fine Bone.	Coarse Bone.		
		%	%	%	%	£ s. d.	
Bonedust ..	Pannifex's Bone Dust Flour	1·00	30·00	95·0	5·0	8 10 0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
,, ..	Pannifex's No. 2	3·50	19·00	50·0	50·0	8 10 0	,, ,, ,, ,, ,, ,,
,, ..	Mount Clear ..	3·00	19·00	50·0	50·0	8 0 0	Bailey Bros., 6 Sturt-st., Ballarat
,, ..	Nuclife ..	4·00	22·00	50·0	50·0	8 0 0	E. F. Peters and Sons Pty. Ltd., Dunolly
,, ..	Pioneer ..	4·07	22·01	50·0	50·0	7 10 0	W. A. Rainey, Mepunga East
,, ..	Apex ..	3·25	20·00	50·0	50·0	7 10 0	North-Eastern Bone Products, Wangaratta

* F.O.R. at Melbourne or Railway Station nearest place of manufacture.

W. R. JEWELL, M.Sc., F.I.C.,
Chemist for Agriculture.

Melbourne, 2nd December, 1940.

H. E. Daw, Government Printer, Melbourne.

Standard Herd Records

For Quarter ended 31st December, 1940

In the following is set out the records of all cows which completed a lactation during the quarter. The number is 261, of which 167 qualified for the certificate. The figure in brackets after the owner's name shows the number of entries.

The amount of butter-fat required for qualification varies with the age class to which the animal belongs, the standard being as follows:—

Junior 2-year-old (under 2½ years at time of calving)	230 lb. butter-fat.
Senior 2-year-old (between 2½ and 3 years at time of calving) ..	250 lb. butter-fat.
Junior 3-year-old (between 3 and 3½ years at time of calving) ..	270 lb. butter-fat.
Senior 3-year-old (between 3½ and 4 years at time of calving) ..	290 lb. butter-fat.
Junior 4-year-old (between 4 and 4½ years at time of calving ..	310 lb. butter-fat.
Senior 4-year-old (between 4½ and 5 years at time of calving) ..	330 lb. butter-fat.
Mature cow 5 years and over	350 lb. butter-fat.

(Except where otherwise stated, the period of test was 273 days.)

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Alston, Mrs. N. B. and Sons, Romsey, Jersey (3).										
Rosyth Gay Princess ..	55121	12.3.40	23	7,178	5·36	334·52	350	Mature	335, 295, 320, 395	Werribee Gaypiece
Rosyth Gay Rosebud ..	64112	9.2.40	17½	6,369	5·42	345·43	310	Jr. 4	237, 340 ..	Werribee Gaypiece
Rosyth Gay Rosebud 4th	73807	14.1.40	13	4,239	5·69	241·35	230	Jr. 2	.. ..	Werribee Gaypiece
Atkinson, W. K., Swan Hill, Dairy Shorthorn (10).										
Willow Park Camelia 29th	Vol. 2	28.2.40	15	5,838	3·71	216·35	230	Jr. 2	.. ..	Anderson Imperial Cran 6th (Imp.)
Willow Park Camelia 30th	Vol. 2	21.3.40	21½	7,077	3·40	240·68	230	Jr. 2	.. ..	Anderson Imperial Cran 6th (Imp.)
Willow Park Comet 7th ..	1231E	8.1.40	23½	13,437	3·61	485·45	350	Mature	284, 378, 446, 497, 425, 467, 462	Willow Park Design
Willow Park Countess 9th	1244E	24.3.40	34	11,078	4·07	451·21	350	Mature	396, 489, 443, 476, 463, 456	Willow Park Imperial 3rd
Willow Park Duchess 26th	1286E	7.1.40	15	9,721	4·27	414·76	350	Mature	300, 364, 429, 430	Willow Park Imperial 3rd
Willow Park Fairy 8th ..	1296E	3.2.40	26½	8,556	3·99	341·30	350	Mature	279, 293, 320	Willow Park Silvermine 4th
Willow Park Melba 11th ..	1311E	1.3.40	22	8,880	3·97	352·78	350	Mature	342, 375, 369, 481, 441	Willow Park Imperial 3rd
Willow Park Melba 15th ..	1315E	11.2.40	35	11,100	4·36	483·62	350	Mature	414, 426, 446, 460	Willow Park Lustre 3rd
Willow Park Melba 28th ..	Vol. 2	8.2.40	24	9,632	3·57	343·47	270	Jr. 3	289 ..	Anderson Imperial Cran 6th (Imp.)
Willow Park Moss Rose 14th	Vol. 2	14.2.40	30	11,151	3·28	366·10	270	Jr. 3	283 ..	Wicklesham Lord Barrington 5th (Imp.)
Ballarat Orphanage, Ballarat, Jersey (8).										
Orphanage Attraction 5th	68452	12.2.40	32	9,193	5·70	524·32	350	Mature	425, 399, 421	Jerseylea Quality Boy
Orphanage Clara 3rd ..	58811	12.2.40	26	8,155	5·95	483·13	310	Jr. 4	.. ..	Rowallan Celebrity
Orphanage Doris 6th ..	73303	29.2.40	21	8,520	5·62	479·07	290	Sr. 3	.. ..	Retford King Bracken
Orphanage Lady 5th ..	58817	30.12.39	12	6,561	5·49	360·12	350	Mature	339, 325 ..	Retford King Bracken
Orphanage Mannikin's Attraction	32931	7.1.40	24	7,928	5·45	432·31	350	Mature	260, 470, 358, 431	Audrey's Prince of Banyule
Orphanage Maud ..	41404	21.1.40	20	6,539	5·63	367·89	350	Mature	315, 420, 373, 448	Orphanage Quicksand's Prince
Orphanage Melba 16th ..	C.R.	20.1.40	14	5,613	5·45	307·41	230	Jr. 2	.. ..	Banyule Terraplane
Orphanage Mirthmaker 7th	58821	31.12.39	22	8,250	5·08	418·72	350	Mature	325, 425 ..	Orphanage Molly's Thorn
Bennett, J. W., Yinnar, Jersey (3).										
Ellendale Banksia ..	66333	24.3.40	N.C.K.	6,155	5·34	328·76	350	Mature	272 ..	Mistletoe 2nd's Treasure of Lynuilg
Ellendale Bluebell 12th ..	61416	2.3.40	N.C.K.	6,801	5·33	362·52	310	Jr. 4	.. ..	Staghorn Bellboy
Ellendale Kirsty 26th ..	66336	2.3.40	N.C.K.	7,398	5·12	378·48	310	Jr. 4	.. ..	Staghorn Bellboy
Bennett, R. H., Lancefield, Jersey (1).										
Edenhope Fancy's Twylish	66301	25.3.40	19	6,786	4·90	332·76	290	Sr. 3	.. ..	Edenhope Canary's Count
Butcher, F. T., Murraydale, Red Poll (2).										
Maryville Fay	6910A	30.1.40	15½	5,346	4·07	217·60	230	Jr. 2	.. ..	Temperley Prism
*Maryville Merle ..	7078B	26.3.40	4	2,940	4·32	126·88	230	Jr. 2	.. ..	Chandpara Ferdinand
Chadderton, J. E., Hamilton, Jersey (1).										
Glen Leigh Dolly 3rd ..	52824	6.2.40	17	5,393	5·05	272·26	330	Sr. 4	354 ..	Glen Leigh Bounty

* 240 days in test.

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Clarke, F. W., Toora, Jersey (2).										
Mer Vue Cissie	67911	8.1.40	19	6,147	6·37	391·41	270	Jr. 3	208 ..	Mer Vue Flash Prince
Mer Vue Joy	63049	13.3.40	28	7,796	6·72	523·67	350	Mature	522, 595, 442	Flashlight of Woorayl
Clark, P. W., Whittlesea, Jersey (9).										
Coodardy Centurion's Annette	70823	2·1·40	23	6,746	5·11	344·69	230	Jr. 2	.. ..	Werribee Centurion
Coodardy Centurion's Fascination	70824	14.2.40	15	5,543	5·15	285·33	230	J. 2	.. ..	Werribee Centurion
Coodardy Centurion's Gloria 2nd	70827	20.1.40	25	7,395	5·15	381·02	230	Jr. 2	.. ..	Werribee Centurion
Coodardy Centurion's Lady	70828	22.1.40	22	6,519	5·38	350·44	230	Jr. 2	.. ..	Werribee Centurion
Coodardy Centurion's Liberty	70829	10.2.40	32	8,889	4·64	412·75	230	Jr. 2	.. ..	Werribee Centurion
Coodardy Gentle Annette 9th	70830	5.1.40	22	7,295	4·98	363·47	250	Sr. 2	.. ..	Staghorn Lord Aldan 3rd
Coodardy Gloria 5th ..	56871	6.3.40	28	9,999	5·72	571·51	350	Mature	360, 468 ..	Kantara Don Juan
Maiwand Ivy	49344	4.2.40	20	6,929	5·30	367·30	350	Mature	315 ..	Aveley Rex
Tooronga Princess Mona ..	50904	4.3.40	17	8,166	5·02	410·34	350	Mature	319, 363, 444	Kantara Don Juan
Clark, W. J., Monomeith, Jersey (5).										
Glenavon Diana 19th ..	71446	19.3.40	16	5,613	5·99	336·11	230	Jr. 2	.. ..	Glenavon May Star
Glenavon May Gem ..	C.R.	23.2.40	17	5,541	5·58	309·18	270	Jr. 3	.. ..	Glenavon May Star
Glenavon Starbright ..	43986	19.3.40	13	4,689	5·54	259·60	350	Mature	.. ..	Banyule Airshaft
Glenavon Starbright 4th ..	66610	25.2.40	22	6,996	5·68	397·23	310	Jr. 4	.. ..	Glenavon Betty's Star
Rockdale Gama 3rd ..	68909	24.2.40	12	4,446	6·82	303·16	330	Sr. 4	.. ..	Rockdale Lord
Coulthard, J. J., Whittlesea, Jersey (6).										
Elmwood Merry Lark ..	57189	26.3.40	N.C.K.	6,940	5·56	385·71	350	Mature	363, 416, 335, 405	Austral Valley Lord Larkspur
*Elmwood Show Gift ..	66370	25.3.40	4	2,684	6·05	162·34	270	Jr. 3	253 ..	Elmwood Merry Boy
†Walamba Bonnie Babs ..	C.R.	6.3.40	4	1,605	5·57	89·32	290	Sr. 3	282 ..	Walamba Shiek
Walamba Kirsty's Pride ..	69563	26.1.40	N.C.K.	5,074	5·90	299·58	290	Sr. 3	245, 279 ..	Mornmoot Manifest 2nd
‡Walamba Merry Lou ..	69565	28.3.40	4	1,260	5·03	63·35	250	Sr. 2	224 ..	Clarendon Eyre Brigadier 3rd
Walamba Rosy Morn ..	C.R.	21.1.40	N.C.K.	5.243	5·34	279·86	230	Jr. 2	.. ..	Selsey Wonderful Boy
Crawford, Mrs. E., Traralgon, Jersey (1).										
Balniel Lady Fox ..	C.R.	9.1.40	9	3,917	5·31	207·80	230	Jr. 2	.. ..	Pine Grove Duke
De La Rue, N. C., Weering, Jersey (4).										
Balcairn Madeira ..	70124	25.3.40	17½	5,858	6·05	354·19	250	Sr. 2	.. ..	Selsey Brampton Boy
§Glen Iris Belladonna ..	39334	18.2.40	4	5.205	5·29	275·15	350	Mature	269, 115 ..	Glen Iris Bowbells
Lucerne Vale Madeira 3rd	49243	22.3.40	18	7,390	5·55	410·27	350	Mature	283, 335, 441, 546	Lucerne Vale Grandmaster
Victoria Winsome ..	37218	31.12.39	24	8,267	5·37	444·33	350	Mature	377, 479, 435, 352, 511	Victoria Master Mariner
Devon Park Stud Farm (Daley, G. S.), Lilydale, Jersey (4).										
Belgonia Design's Lady 2nd	56315	23.2.40	20½	6,842	5·45	373·06	310	Jr. 4	312, 261 ..	Design's Ruler (Imp.)
Clarendon Eyre Cinderella	52253	13.3.40	19	7,067	5·70	402·57	350	Mature	331, 450, 242	Clarendon Eyre Eminent's Achievement
Clarendon Eyre Primrose 2nd	47632	18.3.40	17	6,968	5·20	362·20	350	Mature	368, 390, 354	Victorious Pioneer
Glen Iris Royal Chance ..	71420	20.3.40	13	5,442	5·93	322·98	250	Sr. 2	.. ..	Glen Iris Royal Gallant
Dennis, Mrs. A. A., Frankston, Jersey (1).										
Ballam Laura	65285	13.2.40	22	6,921	5·17	357·62	230	Jr. 2	.. ..	Somerville Preference
Department of Agriculture, Werribee, Friesian (6).										
Victoria Choree	5105	3.2.40	23½	10,233	3·31	338·60	350	Mature	263, 357, 401, 397	Victoria Double Top
Victoria Domino Josie ..	6080	4·2.40	26½	8,825	3·80	335·29	270	Jr. 3	330 ..	Rupertswood Inka Jo
Victoria Double Plebe ..	6082	25.1.40	43	16,791	2·89	485·37	350	Mature	369, 493, 492	Victoria Double Top
Victoria Euphony ..	6033	3·1·40	11	6,686	3·37	225·22	290	Sr. 3	291 ..	Victoria Double Top
Victoria Madrigal ..	6093	5.1.40	35	8,597	3·53	303·20	270	Jr. 3	.. ..	Victoria Joyous Mercedes
Victoria Woodcrest Daisy	5112	15.3.40	27	9,713	3·61	350·93	350	Mature	307, 389, 425, 416, 536	Victoria Joyous Mercedes
Department of Agriculture, Werribee, Red Poll (13).										
Victoria Amethyst ..	Vol. 11	15.2.40	19	6,215	4·57	284·10	230	Jr. 2	.. ..	Victoria Donald
Victoria Bodikin ..	7010A	9.1.40	26	8,568	4·17	357·19	290	Sr. 3	277 ..	Victoria Goblin
Victoria Clinker	Vol. 11	30.1.40	18	5,958	4·61	274·45	230	Jr. 2	.. ..	Victoria Donald
Victoria Countess ..	Vol. 11	13.3.40	16	5,894	4·65	274·35	230	Jr. 2	.. ..	Chandpara Valentine
Victoria Grateful ..	Vol. 11	19.2.40	18½	5,537	4·77	263·97	250	Sr. 2	.. ..	Woodburn Peter Pan
Victoria Marjorie ..	Vol. 11	18.3.40	21	6,125	4·40	269·50	230	Jr. 2	.. ..	Chandpara Valentine
Victoria Marsupalia ..	3916A	22.1.40	24	9,267	4·59	425·56	350	Mature	290, 429, 466	Dominion Bright Belgian
Victoria Peach	6025A	8.1.40	15½	6,152	4·49	276·25	350	Mature	238, 303 ..	Victoria Gallant
Victoria Pepita	6027A	1.3.40	23	9,107	4·60	418·85	350	Mature	370, 406 ..	Woodburn Peter Pan
Victoria Pert	7018A	16.1.40	30	8,366	3·85	322·22	290	Sr. 3	295 ..	Chandpara Valentine
Victoria Red Tape ..	7022A	21.3.40	19	7,156	5·02	359·20	310	Jr. 4	256, 293 ..	Woodburn Peter Pan
Victoria Wendy	6034A	13.3.40	17	7,379	4·84	357·27	330	Sr. 4	369, 316 ..	Woodburn Peter Pan
Victoria Wildwood ..	6036A	12.1.40	17	8,196	3·97	324·99	350	Mature	353, 317 ..	Woodburn Peter Pan

* 210 days in test. † 150 days in test. ‡ 120 days in test. § 180 days in test.

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Dookie Agricultural College, Dookie, Ayrshire (8).										
Dookie Agnes	30379	28.3.40	19	7,826	3·96	309·85	350	Mature	304, 329 ..	Longerenong Baron
Dookie Dancer	30380	16.2.40	18½	7,841	4·87	381·51	330	Sr. 4	353, 360 ..	Tregorland Indispensible
Dookie Delysia	Vol. 33	20·3.40	20	7,334	3·82	280·39	250	Sr. 2	.. ..	Tregorland Indispensible
Dookie Floss	23668	3.3.40	18	6,977	4·16	290·30	350	Mature	406, 341, 444, 347, 333, 350	Longerenong Laurie
Dookie Flossie	Vol. 33	10.3.40	13	4,541	4·24	192·51	230	Jr. 2	.. ..	Gowrie Park Bonnie Sailor
Dookie Hope	Vol. 33	14.3.40	8	7,089	4·12	292·22	290	Sr. 3	.. ..	Tregorland Indispensible
Dookie Playful ..	30384	24·3·40	17	7,914	4·46	353·11	350	Mature	351 ..	Tregorland Indispensible
Dookie Sweetness ..	32245	10.1.40	23½	7,221	3·93	283·89	270	Jr. 3	.. ..	Dookie Shirley's Boy
Eltringham, W. B., Wandin North, Jersey (1).										
Clifford Farm Diana ..	70726	6.3.40	25½	7,787	5·50	428·58	230	Jr. 2	.. ..	Clifford Farm Danny Boy
Fadersen, J. H., Mandurang, Jersey, (1).										
Banyule Molly 59th ..	56257	11.1.40	20½	5,665	6·83	386·90	270	Jr. 3	358 ..	Banyule Biplane
Fairchild and Clutterbuck, Tinamba, Jersey (2).										
Fairbank Butterfly 2nd ..	57253	29.1.40	N.C.K.	6,401	5·15	330·00	330	Sr. 4	270 ..	Wompini Beau Brummel
Fairbank Queenie 3rd ..	61572	8.1.40	N.C.K.	6,111	5·62	343·16	290	Sr. 3	276 ..	Fairbank Chorus
Foster, A. O., Boisdale, Jersey (4).										
Boisdale Beauty 3rd ..	C.R.	17.1.40	10	2,692	5·26	141·65	250	Sr. 2	.. ..	Boisdale Masterpiece
*Boisdale Maple	C.R.	10.1.40	4	1,800	5·52	99·29	230	Jr. 2	.. ..	Boisdale Masterpiece
Boisdale Natty 3rd ..	65513	7.2.40	6½	3,030	5·95	178·21	270	Jr. 3	177 ..	Wompini Master Grey
Boisdale Nymph 2nd ..	C.R.	29·12.39	15	4,605	6·33	291·62	230	Jr. 2	.. ..	Boisdale Masterpiece
Gay, R. G., and Son, North Devon, Jersey (2).										
Elm Grove Laurette 2nd ..	61465	17·3·40	29½	9,237	5·43	501·25	310	Jr. 4	310 ..	Elm Grove Graceful's Masterpiece
Myrtle Point Songstress ..	45341	29.2.40	30	10,376	5·14	533·63	350	Mature	458, 498, 540, 604, 507	Werribee Master King
Goddard, J. H., Cora Lynn, Ayrshire (1).										
Crescent Farm Beryl 3rd ..	32136	16.3.40	30	9,648	4·75	457·83	310	Jr. 4	258, 338 ..	Crescent Farm Gordon
Handbury, J. E., and Son, Toora, Jersey (2).										
Tooravale Lassie 31st ..	Vol. 28	11.2.40	27½	6,356	5·48	348·13	250	Sr. 2	.. ..	Pinewood's Aristocrat (Imp.)
Tooravale Milkmaid 25th ..	64612	22.1.40	21½	6,560	6·11	400·65	310	Jr. 4	426 ..	Pinewood's Aristocrat (Imp.)
Harvey, T., Boisdale, Jersey (12).										
Jerseyholm Bluebell 18th ..	44479	24.2.40	23	7,839	5·20	407·53	350	Mature	371, 433, 367, 446	Werribee Master's Fox
Jerseyholm Bluebell 36th ..	62307	4·1·40	20	6,782	4·76	322·58	250	Sr. 2	227 ..	Banyule Biplane
Jerseyholm Bluebell 40th	67187	10.1.40	15½	5,232	5·10	266·63	230	Jr. 2	.. ..	Rowallan Silvanite
Jerseyholm Bluebell 42nd	67189	5.2.40	10	3,345	5·65	189·19	230	Jr. 2	.. ..	Rowallan Silvanite
Jerseyholm Bluebell 43rd	67190	28.1.40	18½	5,779	4·67	269·97	230	Jr. 2	.. ..	Rowallan Silvanite
Jerseyholm Empress 45th	53362	25·1·40	24	9,116	4·92	448·20	350	Mature	343, 361, 447	Jerseyholm Master's Fox 6th
*Jerseyholm Empress 51st	57849	4.3.40	..	3,705	5·53	204·90	310	Jr. 4	257 ..	Jerseyholm Master's Fox 6th
Jerseyholm Empress 53rd	57850	4.3.40	16	5,208	5·44	283·22	290	Sr. 3	217, 290 ..	Jerseyholm Master's Fox 6th
Jerseyholm Empress 61st	67194	21.1.40	19	5,561	4·56	253·81	230	Jr. 2	.. ..	Rowallan Silvanite
Jerseyholm Empress 62nd	67195	22.2.40	16½	5,105	4·80	244·95	230	Jr. 2	.. ..	Rowallan Silvanite
Jerseyholm Empress 63rd	67196	16.2.40	15	4,380	6·00	262·80	230	Jr. 2	.. ..	Orphanage Molly's Commander
Jerseyholm Lady Marge 14th	53367	5·2·40	19½	6,217	5·89	366·28	350	Mature	273, 249, 366, 323	Werribee Master's Fox
Haywood, Dr. A. R., Hastings, Jersey (8).										
Somerville Couer-de-Rose 4th	69099	22·1·40	15	4,878	6·73	328·43	270	Jr. 3	223 ..	Somerville Chief Ruler
Troed-yr-Rhiw Tawelwych 6th	74269	4.3.40	22	6,696	5·23	350·20	230	Jr. 2	.. ..	Clarendon Eyre Eminent's Boomerang 6th
Windrest Chevy's Cherub	64936	20.2.40	21	7,143	5·92	423·07	330	Sr. 4	386, 355 ..	Glen Iris Matador
Windrest Day Lady ..	64937	11.3.40	11½	4,737	5·13	243·00	310	Jr. 4	237, 302 ..	Windrest Chevy's Chap
Windrest Gay Marie ..	69732	19.2.40	14	5,290	5·80	307·06	270	Jr. 3	201 ..	Gadget (Imp.)
Windrest Iris's Moonbeam	74579	3.2.40	20	5,823	6·10	354·96	250	Sr. 2	.. ..	Clarendon Eyre Eminent's Geisha 3rd
Windrest Rose Marie 3rd	74582	19.2.40	15	5,727	6·17	353·15	270	Jr. 3	262 ..	Windrest Prince Madeira
Windrest Twinkle's Dream	64940	25.3.40	7½	5,307	5·82	308·93	310	Jr. 4	240, 299 ..	Glen Iris Matador
Henderson, W., Grasmere, Ayrshire (3).										
Carracoorte Blanche 10th	24076	14.3.40	10½	5,852	4·63	271·13	350	Mature	255, 250, 331, 334, 358	Blue Bell's Pride of Glencourt
Carracoorte Briar Bud 3rd	C.R.	16.1.40	13½	5,159	5·08	262·01	350	Mature	232 ..	Grandview Bernie
Carracoorte Buttercup 4th	29205	6·3·40	8½	4,144	4·56	189·16	350	Mature	133, 202 ..	Grandview Begonia's Hot Stuff

* 210 days in test.

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Higgins, J. A. A., Keysborough, Guernsey (1).										
*Melbourne Golden Bloom	5881	18.1.40	4	2,935	4·19	125·03	330	Sr. 4	.. ..	Yarraview Bob
Hore, E., Leitchville, Jersey, (1).										
Taranah Roseleaf 4th ..	37589	11.2.40	16	6,573	4·69	308·02	350	Mature	445, 450, 525, 489, 413	Taranah Submarine
Hore, L. G., Horfield, Illawarra Shorthorn (4).										
Horfield Alison 6th ..	Vol. 7	10.3.40	5½	4,652	4·44	206·52	270	Jr. 3	.. ..	Hillview Reliance
Horfield Fashion 5th ..	C.R.	9.1.40	4	5,351	3·96	211·74	270	Jr. 3	.. ..	Hillview Reliance
Horfield Gentle	Vol. 7	20.3.40	5	5,010	4·44	222·27	350	Mature	.. ..	Horefield Acrobat
†Horfield Melba 10th ..	20821	1.1.40	4	8,025	3·19	256·08	350	Mature	.. ..	Horefield Acrobat
Hore, M. T., Horfield, Friesian (1).										
Kurrajong Multi Majoe ..	C.R.	11.2.40	24	6,710	3·79	254·31	230	Jr. 2	.. ..	Elmar Majoe Galatea
Hubbard, Estate of the late A., Yarra Glen, Ayshire (5).										
Emoh Ruo Alvie ..	C.R.	22.3.40	11	7,705	3·67	282·70	350	Mature	271 ..	Fulham Fun
Emoh Ruo Maie ..	Vol. 33	10.2.40	21	8,790	4·05	355·69	350	Mature	.. ..	Fulham Fun
*Emoh Ruo Marionette ..	28335	28.1.40	4	3,600	4·53	163·13	350	Mature	.. ..	Emoh Ruo Advance
Emoh Ruo Modern ..	30417	1.2.40	10½	6,497	3·96	257·33	350	Mature	.. ..	Fulham Fun
Emoh Ruo Muffie ..	C.R.	12.3.40	18	7,558	3·74	282·50	290	Sr. 3	.. ..	Emoh Ruo Diamond
Hurrey, Estate of the late W. H., Koonwarra, Jersey (3).										
Kooreena Lady 7th ..	62627	24.1.40	22	5,999	5·35	321·09	350	Mature	391, 394 ..	Kooreena Carrie 3rd's Halo
Kooreena Lotina 2nd ..	72279	3.3.40	13½	4,789	6·14	294·16	230	Jr. 2	.. ..	Kooreena Good Luck
Kooreena Yo Yo 3rd ..	62631	31.12.39	19½	5,547	6·11	338·80	310	Jr. 4	314, 368 ..	Kooreena Mourier King 2nd
Hutchison, H. McD., Yan Yean, Jersey (1).										
Eulomo Duchess ..	52666	3.2.40	23	7,134	6·03	429·96	350	Mature	249, 443 ..	Melrose Clementine 2nd's Masterpiece
Jones, A. C., Barnawartha, Illawarra Shorthorn (4).										
Coraldale Damsel 4th ..	10047	1.2.40	16	4,871	4·18	203·53	250	Sr. 2	.. ..	Sunnyvale David
Maulvern Primrose ..	C.R.	19.2.40	9½	4,889	3·56	174·20	230	Jr. 2	.. ..	Avondale Theo
Wangoola Polly 2nd ..	C.R.	20.3.40	12	4,336	3·89	168·57	250	Sr. 2	.. ..	Hillview Renown's Combination
Wangoola Sunflower ..	C.R.	19.1.40	26	5,553	3·68	204·45	230	Jr. 2	.. ..	Hillview Renown's Combination
Le Noury, E., Werribee South, Guernsey (1).										
*Werribee Milkmaid ..	6483	5.2.40	4	3,405	4·66	158·51	290	Sr. 3	225, 260 ..	Werribee Prince Don
Longerenong Agricultural College, Dooen, Ayrshire (1).										
Longerenong Cootamundra Wattle 3rd	30757	14.2.40	6½	4,640	3·68	170·93	270	Jr. 3	211 ..	Dookie Punch
Lyon, C. G., Heidelberg, Jersey (8).										
Banyule Lotus Bloom ..	60496	21.1.40	15	4,529	6·29	284·97	230	Jr. 2	.. ..	Banyule Monoplane
Banyule Molly 62nd ..	60497	29.1.40	24	7,578	5·90	446·90	230	Jr. 2	.. ..	Banyule Gipsy Moth
Banyule Molly 63rd ..	65343	14.2.40	16	4,646	5·59	259·60	230	Jr. 2	.. ..	Banyule Double Purple
Banyule Silvermine 101st	51660	26.2.40	19½	6,059	5·92	358·76	310	Jr. 4	.. ..	Banyule Triplane
Banyule Silvermine 108th	56264	1.1.40	30½	8,237	4·99	411·20	270	Jr. 3	369 ..	Banyule Triplane
Banyule Silvermine 121st	65344	18.3.40	21	5,867	4·91	288·01	230	Jr. 2	.. ..	Banyule Monoplane
Rowallan Attraction ..	69020	12.3.40	20	6,371	4·97	316·52	230	Jr. 2	.. ..	Banyule Oxford Don
Rowallan Wildflower 3rd ..	69021	8.1.40	16	5,075	5·06	256·71	230	Jr. 2	.. ..	Banyule Oxford Don
Lyon, W. H., Sale, Jersey (6).										
Avon Dolores	70074	16.3.40	14	4,758	5·29	251·65	230	Jr. 2	.. ..	Avon Morning Star
Avon Elvie	C.R.	22.3.40	12	4,460	5·10	227·45	230	Jr. 2	.. ..	Avon Morning Star
Avon Lady Viola ..	C.R.	28.2.40	10½	3,767	5·88	221·44	230	Jr. 2	.. ..	Avon Morning Star
Avon Lassie Golden ..	70076	4.3.40	16½	4,580	5·52	252·68	230	Jr. 2	.. ..	Ruby's Beau (Imp.)
Avon Nadine	C.R.	26.2.40	8	3,519	5·87	206·59	230	Jr. 2	.. ..	Ruby's Beau (Imp.)
Avon Nalda	C.R.	22.2.40	21½	6,575	4·99	328·30	270	Jr. 3	.. ..	Ruby's Beau (Imp.)
Macauley, C. W., Rochester, Jersey (1).										
Taranah Radiance 2nd ..	59634	2.3.40	22½	7,613	5·65	430·50	330	Sr. 4	348, 364, 527	Taranah Commander
McNabb, G. A., and Son, Irrewillipe East, Jersey (7).										
Avalon Starbright Pansy 9th	70069	22.1.40	18	4,721	5·85	276·20	230	Jr. 2	.. ..	Avalon Starbright 8th
Bellefaire Belle Finesse ..	26738	6.3.40	24½	7,959	4·82	383·36	350	Mature	531 ..	Werribee Prince Twylish
Maxon Chieftain's Marie 2nd	67851	2.3.40	21	6,703	4·57	306·45	250	Sr. 2	.. ..	Maxon Count's Chieftain
Maxon Count's Lady 4th	54019	6.3.40	29	7,992	5·19	414·62	350	Mature	346, 375, 335	Maxon Count Graceful
Maxon Linnacre's Clara ..	63003	21·3·40	15	5,506	6·37	350·52	290	Sr. 3	167 ..	Maxon Linnacre's Starbright 2nd
Maxon Linnacre's Daisy ..	63004	28.3.40	16	6,305	5·93	373·91	290	Sr. 3	202 ..	Maxon Linnacre's Starbright 2nd
Maxon Noble's Belle ..	67853	28.3.40	15	5,400	6·57	354·68	270	Jr. 3	302 ..	Maxon Duchess' Noble

* 180 days in test. † 240 days in test.

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Maloney, P. J., Tongala, Jersey (2).										
Belgonia Buttercup 5th ..	70222	30.12.39	18	7,134	5·64	402·24	230	Jr. 2	.. ..	Aim High (Imp.)
Belgonia Marie 11th ..	70240	23.3.40	26	6,965	5·45	379·34	250	Sr. 2	.. ..	Aim High (Imp.)
Meaklim Bros., Mooroopna North, Dairy Shorthorn (6).										
Drumneil Beauty ..	761E	7.1.40	26½	10943,	4·33	474·27	350	Mature	.. ..	Willow Park Reformer
Drumneil Dulcie	Vol. 2	1.1.40	23	8,748	3·56	311·83	250	Sr. 2	.. ..	Willow Park Lustre 3rd
Drumneil Pansy	780E	4·1·40	20	11,141	3·62	402·88	350	Mature	.. ..	Willow Park Reformer
Drumneil Princess 3rd ..	Vol. 2	13.2.40	15	7,132	4·42	315·54	350	Mature	.. ..	Drumneil Bounty
Drumneil Princess 4th ..	784E	13.3.40	21	8,795	3·79	333·36	350	Mature	.. ..	Darbalara Bounty
Drumneil Princess 6th ..	C.R.	29.2.40	22	7,881	4·13	325·27	270	Jr. 3	.. ..	Willow Park Lustre 3rd
Methodist Central Mission, Tally Ho, Guernsey (3).										
*Melbourne Colette ..	7412	21.3.40	4	2,675	4·20	112·26	270	Jr. 3	.. ..	Yarraview Sequel's Slogan
*Vermont Paula	6430	12.1.40	4	4,795	4·19	201·13	350	Mature	.. ..	Kentdale Sylvanus
Melbourne Lucille ..	7445	29.1.40	12	4,226	4·53	191·52	230	Jr. 2	.. ..	Yarraview Sequel's Slogan
Mitchell, R. H., Linton, Jersey (2).										
Clifford Farm Gloria ..	65959	26.3.40	25	8,702	5·76	501·62	330	Sr. 4	390 ..	Clifford Farm Flashlight
Clifford Farm Jessie ..	43440	2.1.40	26	8,750	4·50	393·35	350	Mature	398, 417, 405, 384	Clifford Farm Don
Moore, J., and Co., Yarram, Jersey (13).										
*Clarendon Eyre Camille 11th	56799	20.2.40	4	5,805	4·98	289·28	350	Mature	298, 336, 477	Victorious Pioneer (Imp.)
Tooloonook Rose 2nd ..	74215	22.2.40	N.C.K.	3,853	4·23	162·96	230	Jr. 2	.. ..	Belgonia Lady's Duke
Rydon Onyx 2nd ..	41927	4.3.40	16	5,185	4·57	237·07	350	Mature	306, 348, 273, 343	Melrose Migrant
Tooloonook Maiden 8th ..	74210	21.2.40	12	4,151	3·97	164·84	230	Jr. 2	.. ..	Belgonia Lady's Duke
†Tooloonook Molly 14th ..	69397	15.2.40	4	2,820	4·14	116·64	310	Jr. 4	210, 281 ..	Tooloonook Carob's Hero
Tooloonook Molly 16th ..	69398	22·3·40	N.C.K.	3,849	5·28	203·11	270	Jr. 3	267 ..	Latrobe Musician
Tooloonook Onyx ..	69399	6.3.40	N.C.K.	4,926	5·04	248·20	270	Jr. 3	302 ..	Rydon Premier
Tooloonook Peach 11th ..	74211	12.3.40	N.C.K.	4,304	4·34	186·79	230	Jr. 2	.. ..	Belgonia Lady's Duke
Tooloonook Peach 12th ..	C.R.	8.2.40	N.C.K.	3,540	5·46	193·16	230	Jr. 2	.. ..	Belgonia Lady's Duke
Tooloonook Plumbago 4th	42249	22.3.40	N.C.K.	6,282	4·46	280·34	350	Mature	271, 309 ..	Somerville Beauty 4th's Command
Tooloonook Plumbago 10th	74213	19.3.40	N.C.K.	4,251	4·34	184·60	230	Jr. 2	.. ..	Belgonia Lady's Duke
Tooloonook Sanfoin 7th ..	74216	19.3.40	N.C.K	3,713	4·96	184·25	230	Jr. 2	.. ..	Belgonia Lady's Duke
Tooloonook Virginia 5th ..	64605	13.3.40	N.C.K.	5,276	5·12	269·90	290	Sr. 3	189 ..	Heroic of Somerville
Murdoch, J., and Son, Lismore, Jersey (1).										
‡Wilton Countess ..	64934	7.3.40	..	5,220	4·56	237·87	310	Jr. 4	251, 297 ..	Murona Twylair
Nicholas, M. A., Sherbroke, Jersey (3).										
Brampton Champion's Lady (Imp.)	56040	8.3.40	14	5,751	5·27	303·28	310	Jr. 4	301, 314 ..	Brampton Son of Champions
Brampton Champion's Miss (Imp.)	56042	28.2.40	9	4,317	5·68	245·32	310	Jr. 4	235, 273 ..	Brampton Son of Champions
Socurette Franchise (Imp.)	56057	23.2.40	14	8,309	4·87	404·74	350	Mature	431, 395, 312 ..	Socurette Fern's Oxford
Noble, T.M., and Sons, Maffra, Jersey (5).										
Finchley Countess ..	71314	7.1.40	23½	6,561	5·77	378·29	230	Jr. 2	.. ..	Finchley Masterman
Finchley Lady Peerless ..	39742	17.3.40	N.C.K.	5,580	6·58	367·33	350	Mature	397 ..	Werribee Lord Burnham
Finchley Lillian	57279	17.2.40	N.C.K.	6,632	6·82	452·24	350	Mature	421, 425, 480	Werribee Lord Burnham
Finchley Lillian 3rd ..	71320	14.3.40	N.C.K.	6,332	6·41	406·09	230	Jr. 2	.. ..	Finchley Vasilika's Masterpiece
Finchley Master's Canary 2nd	61609	25.2.40	N.C.K.	7,990	6·28	501·93	310	Jr. 4	343, 396 ..	Finchley Masterman
O'Neill, J., Echuca Village, Jersey (1).										
Ullina Bonnie	69475	14.3.40	12½	4,433	6·83	302·83	290	Sr. 3	334 ..	Ballara Fancy King
Parker, L. M., Tallarook, Dairy Shorthorn (2).										
Deepdale Cherry 2nd ..	Vol. 2	19.2.40	25	9,180	4·21	386·62	330	Sr. 4	.. ..	Willow Park Banker
Deepdale Poppy	Vol. 2	4.3.40	20½	7,352	3·95	290·47	250	Sr. 2	.. ..	Willow Park Banker
Parks, E. F., Merton, Jersey (4).										
Irona Anthem's Melody ..	C.R.	21·1·40	10	3,045	5·24	159·64	230	Jr. 2	.. ..	Kyora Anthem's Count
§Irona Gay Girl	C.R.	28.2.40	4	600	3·95	27·23	230	Jr. 2	.. ..	Kyora Anthem's Count
Irona Lady Gay ..	44402	20.1.40	19½	5,279	5·38	283·92	350	Mature	.. ..	Burnside Basso
Irona Petal	C.R.	11·1·40	14	4,152	4·80	199·28	230	Jr. 2	.. ..	Kyora Anthem's Count
Pattison, G., Tongala, Ayrshire (1).										
Willow Park Rosina ..	26810	15.1.40	10	8,505	3·81	323·84	350	Mature	278, 376, 355, 347	Fulham Beam
Payne, A. E. T., Lilydale, Guernsey (6).										
Yarraview Julie	3560	23.1.40	31	12,269	4·80	589·35	350	Mature	480, 353, 580, 551	Camilla's Majestic of Maple Lodge (Imp.)
Yarraview Royal ..	6642	21.1.40	16	6,696	4·70	314·42	310	Jr. 4	431, 385 ..	Yarraview Sunrise
Yarraview Siren	6643	12.1.40	30	9,458	5·58	527·51	310	Jr. 4	407, 520 ..	Camilla's Majestic of Maple Lodge (Imp.)

* 240 days in test. † 180 days in test. ‡ 240 days in test (sold.). § 60 days in test.

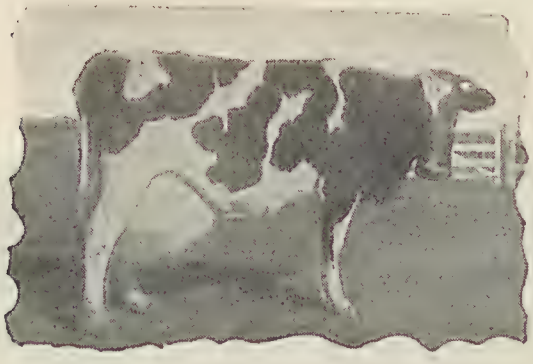
Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Payne, A. E. T., Lilydale, Guernsey (6).—*continued*										
Yarraview Souvenir ..	3568	20.2.40	19	8555,	4·96	423·99	350	Mature	517, 290, 358	Camilla's Majestic of Maple Lodge (Imp.)
Yarraview Sundrop ..	6645	15.2.40	17	8,055	5·31	427·32	310	Jr. 4	350, 307 ..	Yarraview Sunrise
Yarraview Alys	6623	22.3.40	36	9,429	5·21	490·91	330	Sr. 4	379, 430 ..	Yarraview Contralto
Raggatt, F., Tongala, Jersey (1).										
Strathbow Heather Bell 5th	55313	6.2.40	23	7,518	5·50	413·52	350	Mature	297, 419 ..	Grangelea Dapper
Read, Estate of the late J. D., Springhurst, Jersey (3).										
Springhurst Ronald's Duchess	64283	27.3.40	25½	10,023	5·48	549·28	270	Jr. 3	495 ..	Springhurst Sybil's Successor
Springhurst Wexford Tomato	69132	21.3.40	9	4,447	5·70	253·64	230	Jr. 2	.. ..	Twin Oaks Ashley Fern's Noble (Imp.)
Springhurst Xenia's Narcissus	64289	19.3.40	15	6,212	5·31	330·08	250	Sr. 2	229 ..	Glen Iris Anemone's Standard
St. Joseph's Home, Sebastopol, Jersey (2).										
Antrim Boronia	70002	1.1.40	12¼	4,396	5·33	234·20	230	Jr. 2	.. ..	Marfield Joker
Stoneleigh Maud ..	73955	31.12.39	15½	5,222	6·06	316·61	270	Jr. 3	.. ..	Avonlea Airmail
Sambell, A. K. T., Phillip Island, Dairy Shorthorn (3).										
Braeland's Maudie 13th ..	Vol. 2	4.3.40	12	5,932	3·76	222·97	230	Jr. 2	.. ..	Braeland's Pentland's Eros
Trenavin Park Fairy 3rd ..	C.R.	13.2.40	13	6,296	3·83	241·09	230	Jr. 2	.. ..	Willow Park Barrington 21st
Trenavin Park Strawberry 3rd	Vol. 2	26.12.39	20	9,300	3·92	364·87	350	Mature	.. ..	Braeland's 150th Earl of Pentlands
Shearn, J., Jindivick, Jersey (1).										
Navuloa Grandmaster's Madeira	73095	9.2.40	6	2,403	5·26	126·31	250	Sr. 2	.. ..	Werribee Grandmaster
Smith, C. G., Pakenham, Jersey (1).										
Selsey Ricious	50570	10.2.40	28	7,322	5·61	410·41	350	Mature	300, 316 ..	Brampton Great Boy (Imp.)
Stephens, Dr. F. G., Vermont, Guernsey (2).										
Cleveland Peace Bell ..	Vol. 13	18.1.40	18	5,704	5·06	288·84	230	Jr. 2	.. ..	Melbourne Peter Pan
* Vermont Henrietta ..	Vol. 13	15.1.40	4	3,255	5·03	163·70	250	Sr. 2	.. ..	Roads End Henri
Tait, W. S., Dreeite, Jersey (3).										
Stonybank Belladonna 2nd	73957	19·3·40	13	5,365	5·84	313·38	230	Jr. 2	.. ..	Design's Golden Oxford (Imp.)
Stonybank Gaiety Girl 6th	64307	23.2.40	24	8,921	4·83	430·52	330	Sr. 4	491 ..	Stonybank Masterstroke
Stonybank Belladonna ..	73956	1.3.40	19	5,927	5·42	321·15	230	Jr. 2	.. ..	Design's Golden Oxford (Imp.)
Tanberg, G., and Son, Warragul, Illawarra Shorthorn (1).										
Veresdale Birdie	C.R.	28.3.40	15½	6,452	3·89	251·25	250	Sr. 2	.. ..	Swanlea Glenray
Thomas and Taylor, Hamilton, Ayrshire (2).										
Carracoorte Betsy 22nd ..	24674	5·1·40	18	8,874	4·71	417·95	350	Mature	313, 389, 355, 393, 421	Bluebell's Pride of Glencourt
†Jennewar Sylvia ..	29673	15.2.40	4	7,425	4·82	357·53	350	Mature	284, 391 ..	Denbigh Ace
Tomasetti, B. G., Drouin West, Ayrshire (3).										
Glencorren Elva ..	C.R.	21·3·40	22	7,853	4·89	383·88	270	Jr. 3	279 ..	Scotswood Flashlight
Glencorren Lady ..	C.R.	15.2.40	23¾	7,152	3·83	273·79	230	Jr. 2	.. ..	Glen View Sultan
Glencorren Margaret ..	28446	21·2·40	20	7,946	4·37	347·16	350	Mature	303, 315, 349, 322	Scotswood Michael 2nd
Vagg, E. J., Leongatha, Jersey (1).										
Bonnay Doris' Shirley ..	65536	19.3.40	N.O.K.	6,434	5·10	327·97	290	Sr. 3	304 ..	Bonnay Edith's Master-strain
Wade, W. J., Stratford, Jersey (3).										
Inverbroom Empress 2nd	48762	25.1.40	N.O.K.	6,517	4·43	288·42	350	Mature	350, 376, 356, 300	Economist of Aveley
Inverbroom Silver Bunty	53273	7.1.40	N.O.K.	6,035	4·64	280·22	350	Mature	284, 308, 328	Economist of Aveley
Inverbroom Silver Empress	48764	9.3.40	N.O.K.	4,784	4·23	202·45	350	Mature	304, 362, 342, 291	Inverbroom Lord Emperor
Walker, C. S., Swan Hill, Friesian (1).										
Warwick Plebe Canary ..	6107	14.3.40	N.O.C.	12,624	3·29	415·85	350	Mature	256, 340, 400, 323	Greenvale Woodcrest Oakwood 2nd
Wallace, A., Dingee, Jersey (10).										
Grovelea Flower Queen ..	53067	2.2.40	N.O.K.	3,646	5·24	191·09	350	Mature	.. ..	Mornmoot Monarch 2nd
Grovelea Monarch's Duchess	66857	9.3.40	N.O.K.	4,361	4·87	212·57	270	Jr. 3	.. ..	Grovelea Monarch
‡Grovelea Rochette's Kyeema	71700	6.3.40	4	1,485	4·65	68·99	230	Jr. 2	.. ..	Mount Violet Rochette's Volunteer

* 120 days in test. † 240 days in test. ‡ 210 days in test.

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Wallace, A., Dingee, Jersey (10).—*continued*										
Grovelea Rochette's Star ..	71702	14.1.40	N.C.K.	4,260	5·33	226·89	230	Jr. 2	..	Mount Violet Rochette's Volunteer
Grovelea Snowdrift ..	62019	18.3.40	N.C.K.	3,840	5·05	193·97	330	Sr. 4	..	Mornmoot Monarch 2nd
Kenlock Stylish Maid ..	72183	15.1.40	N.C.K.	4,157	5·27	219·13	230	Jr. 2	..	Woodbury Flora's Volunteer
Kingsvale Rosella 23rd ..	53571	8.1.40	N.C.K.	3,792	5·84	221·45	350	Mature	307	Melrose Waywode
Myall Joybell	49743	22.2.40	N.C.K.	3,261	4·39	143·23	350	Mature	113, 223	Kyora Foch
Myall Pretty Maid ..	49744	18.2.40	N.C.K.	5,141	5·34	274·35	350	Mature	..	Kyora Foch
Woodbury Golden Emerald	69770	30.12.39	N.C.K.	4,653	5·18	241·05	270	Jr. 3	..	Selsey Golden Boy
Waterhouse, H. W., and Son, Pakenham, Jersey (5).										
Navuloa Grandmaster's Harebell	63358	21.2.40	17	6,339	5·11	323·89	250	Sr. 2	..	Werribee Grandmaster
Navuloa Larkette ..	68278	16.3.40	18	5,583	5·01	279·94	230	Jr. 2	..	Staghorn Laburnum's Masterpiece
Navuloa Master's Cream ..	54422	2.2.40	27	8,352	5·18	433·05	330	Sr. 4	..	Werribee Grandmaster
Navuloa Master's Ladybird	63365	4.3.40	19	6,896	5·56	383·19	270	Jr. 3	..	Werribee Grandmaster
Ovalan Masterpiece's Cream	73320	21.2.40	23	6,651	5·01	333·42	230	Jr. 2	..	Staghorn Laburnum's Masterpiece
Watson, K. E., Pakenham Upper, Jersey (1).										
Yanguren Bluebell's Rose	51368	17.3.40	20	7,652	4·87	372·97	350	Mature	362, 403, 480	Rosyth Romany Prince
Whelpton, B., Whittlesea, Jersey (1).										
Jubilee Entaxia	57873	7.2.40	30	7,742	5·46	423·03	330	Sr. 4	..	Werribee Stylish Masterpiece
William's F. A., Bamawm Extension, Jersey (1).										
Bamawm Ruth	60474	12.1.40	N.O.C.	9,756	5·40	526·47	350	Mature	402, 492	Bamawm Leon



Tubercle Free Herds

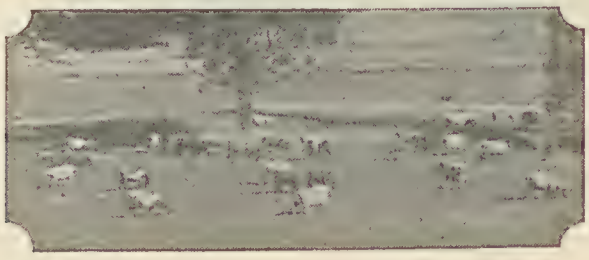
The following herds have been declared free of tuberculosis under the scheme conducted by the Department of Agriculture. Under this scheme a tuberculosis-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests, or, upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

ACCREDITED TUBERCLE FREE HERDS.

Name.	Address.	Number in Herd.	Name.	Address.	Number in Herd.
Banyule Stud Pty. Ltd.	Heidelberg	34	Longerenong Agricultural College	Dooen	46
Black, Estate, late I. S.	"The Cottage," Mount Noorat	46	Onley, W. H. ..	"Glenholme," Caldermeade	67
Black, Miss Grace ..	Mount Noorat ..	35	Payne, A. E. T. ..	"Yarra View," Lilydale	77
Dennis, Mrs. A. A. ..	Frankston	19	Payne, T. E. N. ..	"Woodburn," Kilmore	58
Dookie Agricultural College	Dookie	81	Powell, T. S. ..	"Carellen," Mansfield	41
Dunbar and Clark, Messrs.	"Hazeldean Dairy," Mount Dandenong	15	Read, Estate, late John D.	"Springhurst Estate," Springhurst	112
Gorman, A. W. ..	"Cathcart," Alexandra	80	Reid, Ralph G. ..	"Holmwood," Koowee-rup	78
Henderson, J. L. and E. I.	Wangaratta ..	95	Richardson, Bros., Messrs.	"Faldinghurst," Upper Beaconsfield	30
Holloway, R. W. ..	Caldermeade ..	57	Samuel, B. T. ..	Lang Lang ..	60
Kelly, C.	"Glenmore," Creighton's Creek, Euroa	17	School of Horticulture	Burnley	6
Lawrence, P. H. ..	"Rainga," Tarrawarra	60	State Experiment Farm	Rutherglen ..	51
			State Research Farm ..	Werribee	211

In addition to the above-mentioned herds there are 103 commercial dairy herds containing 3,282 head of cattle which may be considered free of tuberculosis. All these herds have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds, they cannot be considered as accredited under the accreditation scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

There are also 99 herds in which 5,051 head of cattle have passed one test, and may be considered therefore to be in process of becoming tuberculosis-free herds.



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